THE NEWTON OBJECT-LESSON HANDBOOK · I

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The Newton Object-Lesson Handbook

WITH NOTES ON ENGLISH COMPOSITION

NORMAL SCHOOL
CALCUTTA
VERNACULAR

Part I

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NORMAL SCHOOL

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INTRODUCTION.

A glance through the First Newton Reader will show that the book contains some information on common animals, on certain parts of well-known plants, and on a few very common substances.

It must be clearly understood that the reading lessons in this, as well as in the other books of the series, are not intended to take the place of oral object lessons, but rather to provide a useful means of revising lessons previously given by the teacher, and thus fixing on the memory the main points observed during the examination of the objects brought before the class.

It will be seen that all the objects selected for the lessons are such as may be met with without difficulty, either in town or in country. The animals introduced are all British, and may be obtained or observed with no further trouble or time than is expended in taking a short walk. The plants and the vegetable products, too, are to be gathered in almost every district, or purchased at a very low cost; and the common substances dealt with are such as may be found in almost every home. Hence there is no excuse on the part of the teacher for converting what should be an object lesson into a mere lesson of information.

Of course diagrams and pictures are useful in their place, but the best lesson illustrated by these means alone is not to be compared with an *object lesson* in which each child is taught to observe for itself, to make its own comparisons, and to draw its own inferences.

Thus it is intended that each object selected for the following lessons should first be examined by the children themselves, with the aid of the teacher; and that the corresponding reading lesson should serve for revision, and as a means of fixing the main points in the memories of the children.

It is generally impossible to deal with as many observations and facts in a reading lesson of convenient length as would usually be dealt with in an object lesson; hence it will sometimes occur that the former, after all, provides only a partial recapitulation of the subject concerned; but the outline notes here furnished for the use of the teacher contain other points which may be introduced, at the teacher's discretion, according to the time allotted, and to the capabilities of the class to which the lesson is given.

In a few cases, it will be observed, the "objects" selected are such as could not be conveniently conveyed into the schoolroom; but there is no reason for departing from the principle previously laid down—that each lesson should, if possible, be illustrated by the object itself, and not by pictures and diagrams only. Such lessons could, and should, be the purpose of occasional short excursions to neighbouring fields, farmyards, manufactories, or local museums. In elementary schools the Code allows the time taken in such visits to be counted towards attendance.

To facilitate the co-ordination of the teaching of English Composition with the Object Lesson, a series of pupils' composition books has been prepared and issued under the title of "English Composition through Picture and Object Lessons". The series contains three little books, companions to the first three Newton Readers. Each gives composition lessons running parallel to the lessons of the corresponding Reader and Teachers' Handbook. In the Handbooks teachers' notes on these composition lessons are given. See, for example, page 9 of the present volume.

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ENGLISH COMPOSITION

THROUGH

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THE CAT.

Requirements.—A live cat. (The animal should be very tame, or it will not submit to the necessary examination, and will not feed before a class of children.)

Also, if possible, a cat's skull, and a piece of cat's fur; but the latter will not be necessary if the class is a small one, as each child will then have an opportunity of examining the animal itself closely.

Subject Matter.	Method.
Structure.—	
1. *Fur.*—Two kinds of hair:— (*a*) Longer silky hair. (*b*) Shorter, close "under hair".	1. Compare with coat of dog. Explain why the cat's coat is warmer.
2. *Whiskers.* — Long stiff hairs. Serve as organs of touch, being attached to very sensitive skin.	2. Explain use of whiskers.
3. *Ears.*—Outer ear capable of movement.	3. Compare with corresponding part of human ear.
4. *Paws.*—Claws retractile. Soft pads underneath.	4. Why retractile? Use of the pads.
5. *Tongue.*—Very rough.	5. Explain the use of this roughness in carnivorous animals.
6. *Eyes.* — Pupils slit-like in a bright light, and wider in a dull light.	6. Compare the pupil to a window, and explain the advantage of these changes.
7. *Teeth.*—Pointed. Adapted for biting; not for chewing.	7. Show that the cat resembles other carnivorous animals in this respect.
Habits.— Note various habits of the cat, and point out the adaptability of structure to habit.	
1. Cleans its fur. 2. Licks bones clean.	1. } 2. } Use of rough tongue.
3. Climbs well.	3. Use of sharp claws.
4. Bites and bolts its food.	4. Compare with herbivorous animals.
5. Playful. Very agile.	

English Composition can be efficiently taught in connection with Object Lessons. The Notes on the following page refer particularly to Blackie's "English Composition in Picture and Object Lesson", little books in which composition is co-ordinated with the object lesson, a list of which will be found on page 7.

NOTES FOR COMPOSITION LESSONS

(Pupil's Composition Book, p. 3.)

I. Oral Work.

(1) Direct the attention of the class to the pictures in their composition books.

(2) Question them regarding each picture.

(3) Insist upon each answer being given in the form of a complete sentence.

(4) Write down the answers on the black-board, and underline the words to be noted for spelling.

BLACK-BOARD

A. (1) The cat has *nice soft fur.*
(2) The cat *licks* her fur.
(3) The cat licks her fur to *keep* it *clean.*

B. (1) The cat has two *eyes.*
(2) The cat has two *ears.*
(3) The cat has two eyes and two ears.

C. (1) The *dark part* in a cat's eye is round in a *weak light.*
(2) The dark part in a cat's eye *grows narrow* in a *strong* light.
(3) The cat can see better than we can in a *weak* light.

D. (1) The cat's claws are at the *front* of its paws.
(2) The cat has *strong, sharp* claws.
(3) The cat has strong, sharp *claws* at the *front* of its *paws.*

II. Spelling.

(1) Write out the underlined words on black-board.

(2) Get children to give list of words ending in *-ice—mice, rice, spice,* &c.

(3) Treat the other words in a similar way, to form groups.

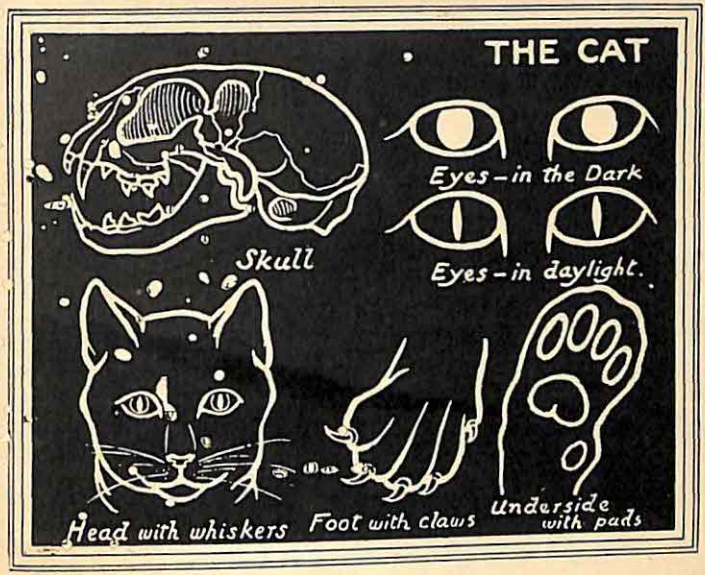
(4) Compare *lit* and *light* to show that *gh* is not sounded but makes the *i* long. Let them give other examples.

(5) Let children copy words on their slates.

III. Written Tests.

(1) Clean the black-board. Arrange the children in groups A, B, C, D, to write the exercise with the corresponding letter.

(2) Correct carefully.



BLACK-BOARD SUMMARY.

Structure.—

1. *Fur.*—Two kinds.
2. *Whiskers.*—Feelers.
3. *Ears.*—Movable.
4. *Paws.*—Pads. Claws.
5. *Tongue.*—Rough.
6. *Eyes.*—Pupils change in size.
7. *Teeth.*—Pointed.

Habits.—

1. Cleans fur. } Tongue.
2. Licks bones. }
3. Climbs well.
4. Bites and bolts its food.
5. Playful.

NOTES FOR THE TEACHER.

The cat belongs to the order **Felidæ**, the group to which the lion, tiger, leopard, puma or panther, and lynx belong. The animals belonging to this family are, in proportion to their size, the strongest, fiercest, and most terrible of beasts. Their **teeth** and **claws** are powerful weapons of attack. They assail their prey by striking it with their powerful fore-paws, and do not, like dogs, first grip it with their teeth. Each fore-paw has **five toes**, and each toe is furnished with a strong **claw**, which is protected, when not in use, by being withdrawn behind folds of skin. There are only four toes, also with claws, on each of the hind feet. Their strong **muscular limbs**, **small head**, and **slim body**, and the **soft pads** with which the toes are furnished enable these animals to move very swiftly, gracefully, and silently. Cats have thirty teeth, and these, especially the four canine teeth, are very powerful weapons. Man has been able only partially to tame one very small member of this family, namely, the domestic cat.

COWS IN THE FIELD.

Requirements.—This lesson should be given in the field if possible. Failing this, it should be illustrated by means of a picture of a cow, the skull or a sketch of a skull; also a horn and a hoof.

Subject Matter.	Method
Structure.—	
1. *Coat.*—Short hair.	1. Compare with fur of cat.
2. *Tail.*—Long and tufted.	2. Note how the tail is used.
3. *Ears.*—Long, move freely.	3. Explain the object of these movements.
4. *Horns.*—Bony processes of the skull covered with horn.	4. Show that the horns are the means of defence.
5. *Hoofs.*—Divided. The two parts spread out when the foot is planted on the ground.	5. Show how this prevents the foot from sinking so far in soft ground.
Habits.—	
1. *Feeding.*—The grass is torn off, and not bitten. Food swallowed without being masticated.	1. Explain how the grass is held between the front teeth of the lower jaw and a pad of cartilage in the upper.
2. *Chewing the cud.*—The cow lies down to masticate its food after having eaten a large quantity.	2. Explain the chewing of the cud; and name other cud-chewing animals, such as the sheep, goat, deer, &c.
The lower jaw moves sideways, as well as up and down.	Show that the broad molars are adapted for chewing; and explain the use of the lateral movement of the jaw.

NOTES FOR COMPOSITION LESSONS

(Pupil's Composition Book, p. 5.)

I. Oral Work.

(1) Direct the attention of the class to the pictures in their composition books.

(2) Question them regarding each picture.

(3) Insist upon each answer being given in the form of a complete sentence.

(4) Write down the answers on the black-board, and underline the words to be noted for spelling.

BLACK-BOARD

A. (1) The cow has a *large body*.
(2) The cow has a *long tail*.
(3) The cow has a large body and a long tail.

B. (1) The cow has *cloven hoofs*.
(2) The cow has *two horns*.
(3) Its horns *grow* in *front* of its *head*.

C. (1) The cow likes to *live* in the *field*.
(2) The cow likes to eat the *grass*.
(3) The cow likes to live in the field and eat the grass.

D. (1) The cow gives us *milk* to drink.
(2) The rich part of milk is called *cream*.
(3) Butter and cheese are made from the milk.

II. Spelling.

(1) Write out the underlined words on the black-board.

(2) Question children for words ending in *-ail—sail, tail, pail*.

(3) Treat other words in same way, to form groups.

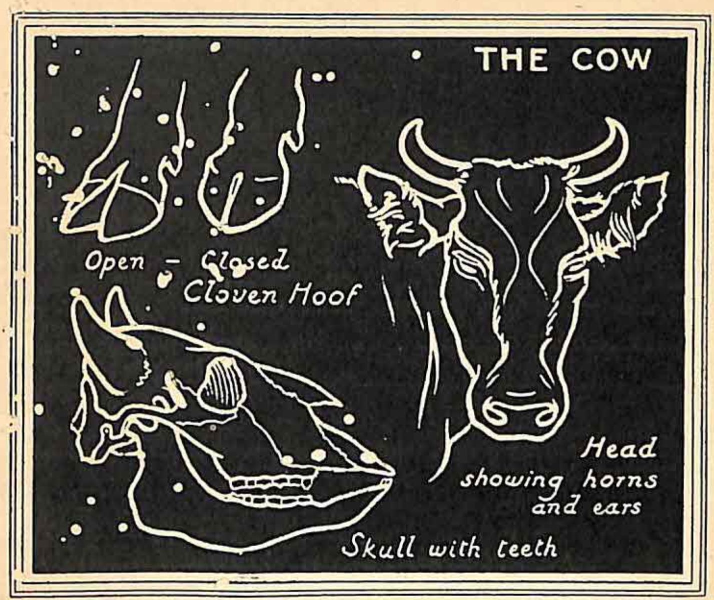
(4) Show that *ie* is always sounded as *e* long, by other examples as *shield*, *yield*.

(5) Let children copy words on their slates.

III. Written Test.

(1) Clean the black-board. Arrange the children in groups A, B, C, D, to write the exercise with the corresponding letter.

(2) Correct carefully.



BLACK-BOARD SUMMARY.

Structure.—

1. *Coat.*—Short hair.
2. *Tail.*—Long and tufted.
3. *Ears.*—Movable.
4. *Horns.*—Bone inside.
5. *Hoofs.*—Divided.

Habits.—

1. *Feeding.*—Grass torn.
2. *Chews the cud.*

NOTES FOR THE TEACHER.

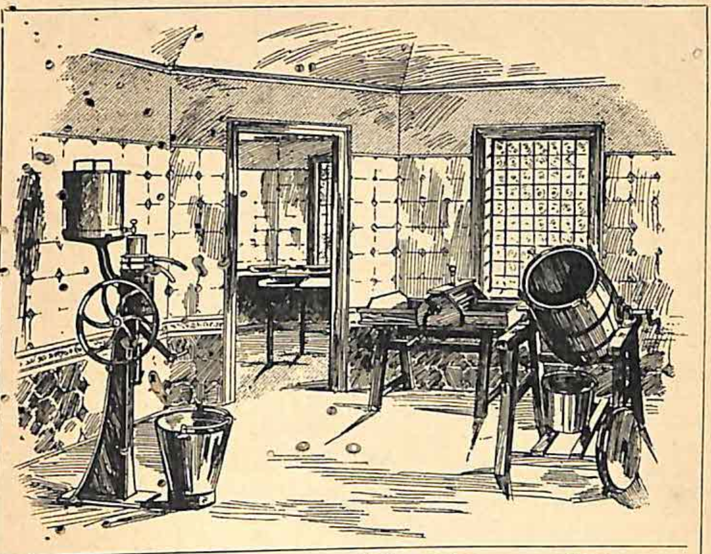
The cow belongs to the order of **Ruminants**, and to that division of it which includes also **sheep, goats**, and **antelopes.** These animals differ from **deer**, another group of the ruminants, in having **permanent** and **hollow horns**, whereas those of the deer are of solid bone, and are shed each year. The horns of the cow are simply rounded and are not twisted like those of the sheep and the goat. The **stomach** of the cow consists of **four compartments**, so distinct from each other that they are often spoken of as separate stomachs. The **foot** of the cow consists of a **pair of toes**, each protected by a hoof or nail and looking as if they had been formed by splitting a single hoof into two equal parts. It is usually said to be "**cloven**".

The teeth of the cow are peculiar. In the upper jaw there are **six grinders** on each side, while the place of the cutting teeth in front is taken by a pad of hardened gum. In the lower jaw, besides the six grinders on each side, there is a series of eight cutting teeth in the front.

THE USES OF THE COW.

Requirements.—Pictures of a dairy, a cow's horn, articles made of horn, a piece of glue, a knife with a bone handle, a piece of old mortar containing hair, suet, and a tallow candle.

Subject Matter.	Method.
Uses of the Living Cow.—	
1. Gives milk. 2. From milk we prepare cream, butter, and cheese.	1. Point out that both cream and butter consist of the fat taken from milk.
Uses of the Dead Cow.—	
1. Flesh used as food. Flesh of cow called beef. That of the calf called veal.	
2. Suet used in making puddings, &c. Tallow prepared from suet. Tallow used for making soap and candles.	2. Show suet and tallow. Point out that tallow is the fat of suet separated from the membrane. Show a tallow candle.
3. Glue made by boiling horns and hoofs.	3. Show a piece of glue, and explain its use.
4. Horns used also for making handles of knives, combs, &c.	4. Show articles made of horn. Note the strength and flexibility.
5. Bones used as manure. The harder bones for handles of knives, &c.	5. Show a knife with bone handle.
6. Hair used for binding mortar.	6. Show a piece of mortar containing hair.



Cream separator. Butter worker. Churn.

A Dairy.

BLACK-BOARD SUMMARY.

Living Cow.—
Milk { Butter. Cheese.

Dead Cow.—
Flesh.—Food.
Fat (suet).—Food; tallow; candles.
Horns and *Hoofs.*—Glue.
Horns.—Combs, &c.
Bones.—Handles of knives; manure.
Hair.—Mortar.

NOTES FOR THE TEACHER.

Most of the **Ox tribe** can be tamed, and some of them are among the animals most useful to man. Their flesh and milk supply him with food, while the skin or hair clothes him. In many parts of the world the ox is used as a beast of draught, and in Devonshire much farm-work, ploughing, &c., is still done by teams of the famous **North Devon** breed.

Cows are chiefly valued in England on account of their qualities as **flesh-makers** or **milk-givers**. Of flesh-makers, the best-known kinds are the **Short-horn**, the **Polled Angus**, and the **Kyloes** or West Highland cattle. The milk-givers of greatest repute are the **Ayrshires**, the **Alderneys**, and the **Suffolk Duns**.

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THE RABBIT.

Requirements.—A live rabbit, and a rabbit's skull to show the teeth.

Note.—A good specimen of the skull may be prepared as follows:—Remove all the flesh from the head, after boiling it, and clear the brain-cavity by means of a bent wire. Then wash it well in water, and dry it in the sun.

Subject Matter.	Method.
Structure.—	
1. *Fur.*—Soft and thick.	1. Compare with fur of cat.
2. *Tail.*—Short.	2. Compare with cat's tail.
3. *Legs.*—Front legs short. Hind legs long and powerful.	3. Note that the long hind legs are adapted for leaping; and that, on account of the unequal lengths of the legs, the rabbit cannot walk well.
4. *Feet.*—The feet have distinct toes, which are provided with claws; but the claws are not retractile.	4. Compare with the feet of the cat; and show that the claws are not sharp, since they are not protected like those of the cat.
5. *Ears.*—Long. Can be moved to collect sounds from different points.	5. Compare with the ears of the cat.
6. *Eyes.*—Note that the eyes are very prominent, and situated at the *sides* of the head.	6. Explain that the eyes are so situated that the rabbit can see behind it without turning its head.
7. *Teeth.*—Sharp cutting or biting teeth in front, and grinding or masticating teeth at the back of the jaw.	7. Contrast with the teeth of the cat; and note that there are no sharp conical teeth like those of the flesh-eating mammals.
Habits.—	
1. Naturally nocturnal in its habits, and may be seen feeding in a wild state in the evening.	1. If possible, a visit should be paid to a rabbit-warren.
2. The rabbit frequently cleans its fur.	
3. Bites its food with its sharp front teeth, and chews it with the back teeth.	3. Show that its teeth are not adapted for tearing, but for biting and mastication. The rabbit does not bolt its food like the cat.
Uses.—	
1. Fur sometimes used for clothing.	
2. Flesh used as food.	

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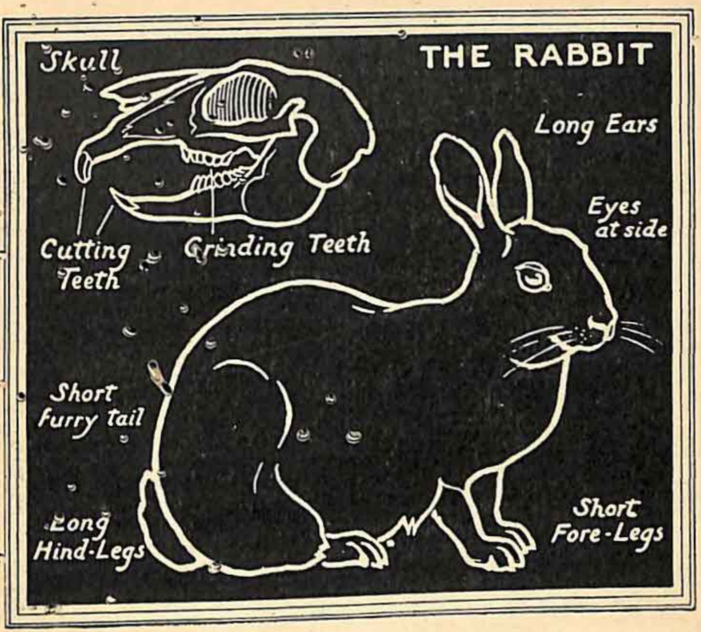


BLACK-BOARD SUMMARY.

Structure.—

1. *Fur.*—Soft.
2. *Tail.*—Short.
3. *Legs.*—Fore legs short. Hind legs long.
4. *Feet.*—Five toes, with blunt claws.
5. *Ears.*—Can be moved.
6. *Eyes.*—At sides of head; project.
7. *Teeth.*—Sharp front teeth. Grinding teeth behind.

Habits.—

1. Out chiefly at night.
2. Cleans its fur.
3. Bites its food with its front teeth, and chews it with the back teeth.

Uses.—

1. Fur for clothing.
2. Flesh for food.

NOTES FOR THE TEACHER.

The rabbit is a small **rodent** of the family **Leporidæ**—the same family to which the hare belongs. The short fore legs have **five toes** or digits, while on the long hind legs there are only **four**. It is smaller than the hare, and has shorter ears and hind legs. Rabbits are so prolific that they may become a pest, as they have in Australia. Hares and rabbits differ from **squirrels, beavers, rats, mice,** and other members of the rodent family, in having an extra, though useless, pair of **cutting-teeth** in the upper jaw. The rabbit's skin is of some value.

THE DUCK.

Requirements.—This lesson should be given in a farm-yard if possible. A few of the cast feathers may generally be found near a duck-pond. Prepare two strips of paper, and rub a little oil on one of them.

Subject Matter.	Method.
Structure.—	
1. *Body.*—Light.	1. Compare with floating wood and cork.
2. *Tail.*—Short; directed upward.	2. Compare with tail of sparrow.
3. *Neck.*—Long; curved; great freedom of movement.	3. Explain that the freedom of movement is due to the large number of bones in the neck.
4. *Legs.*—Short; thick; strong. Feet webbed. Four toes.	4. Compare with feet of hen.
5. *Wings.*—Large, but not sufficiently large and strong to support the body in the air.	5. Compare with the proportionately large wings of birds that fly well.
6. *Feathers.*—Two kinds: quill feathers and down feathers. Keep the body warm.	6. Compare the two kinds of feathers. Explain how bad conductors of heat keep the body warm.
7. *Beak.*—Long; lower portion hollowed somewhat like a spoon.	7. Compare with the beak of the hen.
Habits.—	
1. Very fond of the water. Does not get wet. Feathers slightly oily.	1. Show that a piece of oiled paper cannot be wetted like ordinary paper.
2. Dives for food. Eats worms, pond-weeds, &c.	2. Show use of long neck in reaching food from the bottom of the pond.
3. Uses its beak like a spoon. Has no teeth, and therefore cannot masticate its food.	3. Explain how the food is masticated in the gizzard.
Uses.—	
1. Flesh used for food.	
2. Eggs used as food.	
3. Down feathers for pillows, &c.	

NOTES FOR COMPOSITION LESSONS

(Pupil's Composition Book, p. 7.)

I. Oral Work.

(1) Direct the attention of the class to the pictures in their composition books.

(2) Question them regarding each picture.

(3) Insist upon each answer being given in the form of a complete sentence.

(4) Write down the answers on the black-board, and underline the words to be noted for spelling.

BLACK-BOARD

A. (1) The duck has a *long neck.*
(2) The duck has a *flat beak.*
(3) The duck has a long neck and a flat beak.

B. (1) The duck has *two feet.*
(2) It has *skin between* its toes.
(3) This helps the duck to *swim* in the *water.*

C. (1) The duck has *small eyes.*
(2) Its body is *covered* with *feathers.*
(3) The *young* ducks are *called ducklings.*

D. (1) The duck's *wings* have *long* feathers.
(2) The *stalk* of each feather runs up the *middle.*
(3) The duck folds its wings *close* to its *body* when it swims.

II. Spelling.

(1) Write out the underlined words on the black-board.

(2) Question children for words ending in *-eak*—*beak*, *weak*, *speak*, &c.

(3) Treat other words in same way, to form groups.

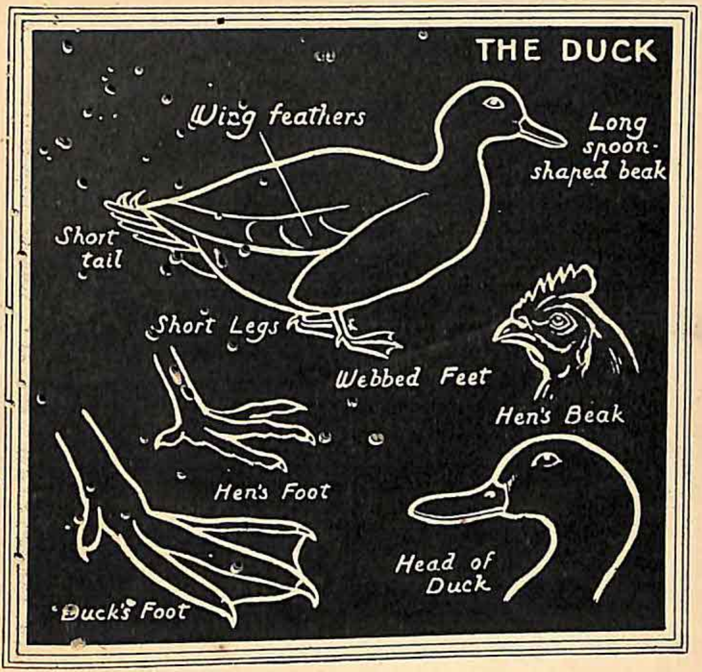
(4) Write *covered*, *called*, &c., syllabically, and notice that *ed* receives only the *d* sound in pronouncing the words. Take other examples as—*toll*, *tolled*; *roar*, *roared.*

(5) Let children copy words on their slates.

III. Written Tests.

(1) Clean the black-board. Arrange the children in groups A, B, C, D, to write the exercise with the corresponding letter.

(2) Correct carefully.



BLACK-BOARD SUMMARY.

Structure.—

1. *Body.*—Light.
2. *Tail.*—Short.
3. *Neck.*—Long.
4. *Legs.*—Short and strong. Feet webbed. Four toes.
5. *Wings.*—Not large enough for flying long distances.
6. *Feathers.*—Two kinds.
7. *Beak.*—Spoon-shaped.

Habits.—

1. Very fond of water.
2. Dives for food.
3. Obtains food from mud.

Uses.—

1. Flesh for food.
2. Eggs for food.
3. Down for pillows.

NOTES FOR THE TEACHER.

The **duck** belongs to the family of the **Anatidæ**, a family which includes, besides ducks, **geese** and **swans**. The feet are short, the bill as a rule straight, with the tip rounded. The three toes turned forward are **webbed**. The **hind toe** is free, but in all it is so small that it does not touch the ground. The food of the duck is partly animal and partly vegetable. The best known of the wild varieties are the **mallard** or wild duck, and the **teal**.

THE SPARROW.

Requirements.—Sparrows should be observed out of doors. The lesson should be further illustrated by pictures and diagrams, including drawings of the foot and the beak.

Subject Matter.	Method.
Structure.—	
1. *Body.*—Very light, and thus adapted for flight.	1. Explain that the lightness of the body is due to the large amount of air within it. Some of the bones are also hollow.
2. *Wings.*—Large in proportion to the size of the bird.	2. Compare with the wings of a duck.
3. *Feathers.*—Two kinds, as in the duck.	3. Show how the feathers of the wings and the tail can be spread for flying.
4. *Legs.*—Slender. Feet with three toes directed forwards, and one backwards.	4. Show that the foot is adapted for perching. Contrast with foot of duck.
5. *Beak.*—Short, stout, cone-shaped, and sharp-pointed.	5. Contrast with that of the duck.
6. *Eggs and Nest.*—Nest built by the parents. Young produced from eggs.	6. Show the sparrow's nest and eggs if possible. If not, pictures of them.
Habits.—	
1. The sparrow is a type of the perching birds.	1. Name other perching birds. Show that the group includes our songsters.
2. Food consists of worms, insects, seeds, &c. The sparrow has no teeth. Food masticated in a gizzard.	2. Show how the beak is adapted for picking up the sparrow's food. Recall the action of the gizzard, as explained in last lesson.
3. The sparrow flies well, spreading out the feathers of its wings and tail.	3. Explain that the sparrow flies by beating its wings against the air.

NOTES FOR COMPOSITION LESSONS

(Pupil's Composition Book, p. 8.)

I. **Oral Work.**

(1) Direct the attention of the class to the pictures in their composition books.

(2) Question them regarding each picture.

(3) Insist upon each answer being given in the form of a complete sentence.

(4) Write down the answers on the black-board, and underline the words to be noted for spelling.

BLACK-BOARD

A. (1) The sparrow's beak is *short*.

(2) The sparrow's beak is *pointed*.

(3) The sparrow's beak is short and pointed.

B. (1) The sparrow's foot has *four toes*.

(2) The sparrow's foot has *three* toes in *front*.

(3) The sparrow's foot has *one* toe *behind*.

(4) The sparrow's foot has three toes in front and one behind.

C. (1) The sparrow's toes have *sharp claws*.

(2) The sparrow holds on to a *twig* with its toes.

(3) The sparrow *eats flies* and *worms*.

II. **Spelling.**

(1) Write out the underlined words on black-board.

(2) Compare *arrow*, *barrow*, *sparrow*, *narrow*.

(3) Question for group of words ending in *-eak*, as *leak*, *speak*, &c.

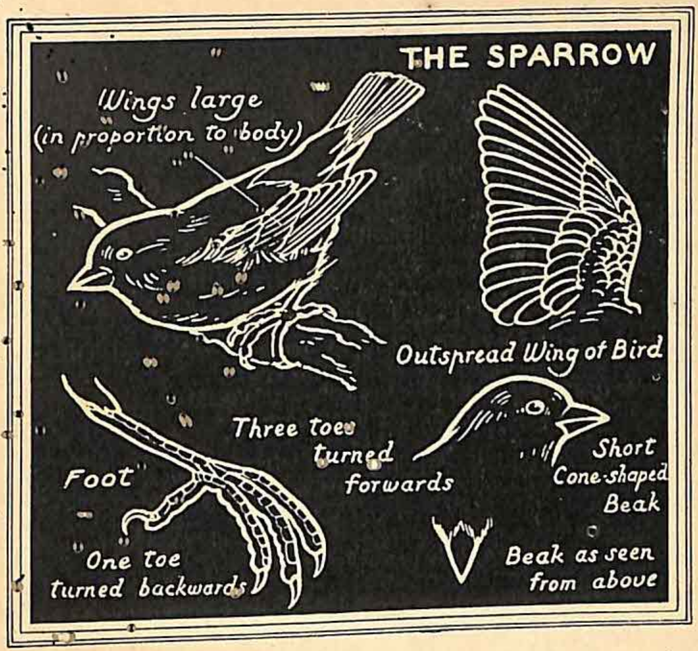
(4) Treat other words in the same way, to form groups.

(5) Let children copy words on their slates.

III. **Written Tests.**

(1) Clean the black-board. Arrange the children in groups A, B, C, to write the exercise with the corresponding letter.

(2) Correct carefully.



BLACK-BOARD SUMMARY.

Structure.—

1. *Body.*—Very light.
2. *Wings.*—Large.
3. *Feathers.*—Two kinds.
4. *Legs.*—Slender. Foot with four toes.
5. *Beak.*—Short and round.
6. *Eggs and Nest.*—Nest built by parent.

Habits.—

1. Perches on trees.
2. Feeds on worms, insects, and seeds.
3. Flies well.

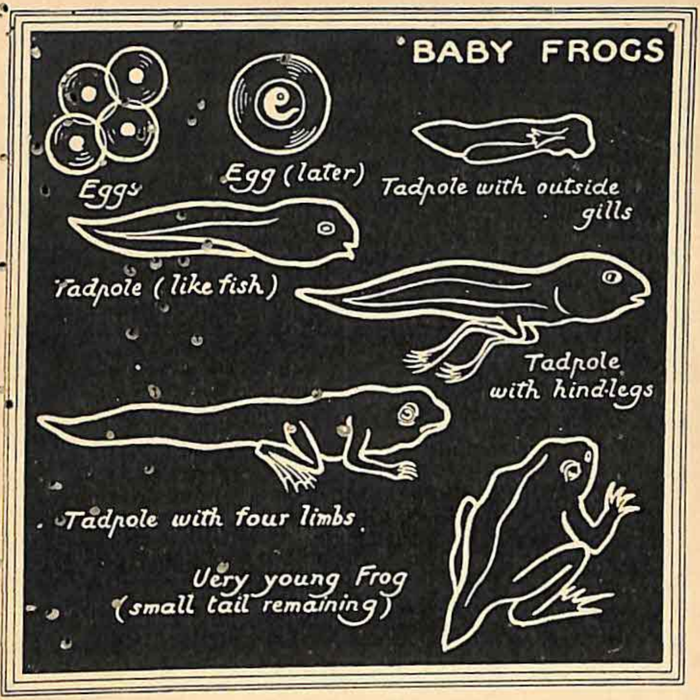
NOTES FOR THE TEACHER.

The sparrow belongs to the great family of the "Finches", which comprises more than 500 species scattered all over the globe, except in the Australian regions. Other members of the family are the **Chaffinches**, **Goldfinches**, **Bullfinches**, **Linnets**, **Greenfinches**, and **Yellowhammers**. The family belongs to the order of **perching birds** (*Passeres*), the largest of all the orders of birds, containing more than half the whole number of birds known. Their feet are specially suited for the work of **nest-making**, and are furnished with well-developed toes and claws, the claw of the hind toe being larger than that of the others.

BABY FROGS.

Requirements.—The lesson should be illustrated by a diagram showing the development of the frog. Frogs' eggs should also be obtained, about the end of March, and placed in an aquarium, so that the children may observe the development day by day. The aquarium should be large enough to hold a few gallons of water. If some pond-weeds be introduced, the water need not be changed. The development into frogs will occupy several weeks. When the tadpoles have finally grown into frogs, they should be removed from the aquarium, and set at liberty in a damp place.

Subject Matter.	Method.
Frogs' eggs.—	
Black, and surrounded by a transparent jelly-like covering. All joined together. Soon after they are laid, the jelly-like substance absorbs water and swells considerably.	Let the children observe these changes from day to day. Drawings of the eggs should be made at each observation.
Changes in the egg.—The black embryo elongates; then becomes fish-like in form, and escapes from the jelly-like covering.	
Development of the tadpoles.—	
At first fish-like, and gregarious, but not very active. Also limbless, and breathe by tuft-like gills.	Further changes to be observed as before, and sketches made. The tuft-like gills should be pointed out.
The tuft-like gills soon disappear, and the tadpole then breathes by internal gills.	Note how the tadpole swims by means of its tail.
Hind legs grow slowly. Then fore legs. The tail also gradually disappears (absorbed into the body). It is now a frog.	Explain that the frog breathes by lungs, hence the young frogs have to come to the surface for air. They also swim by means of their hind legs.



BLACK-BOARD SUMMARY.

Eggs.—Black, surrounded by jelly.
Tadpole.—At first without legs.
Breathes by gills.
Hind legs appear.
Then fore legs.
Gills and tail disappear.

NOTES FOR THE TEACHER.

In early spring frogs awake from their winter's sleep and then egg-laying begins. The eggs are laid at the bottom of the water and left to themselves. As soon as they touch the water the albumen which surrounds each egg swells up and the egg appears a jelly-like semi-transparent mass. The **tadpole** is a vegetable feeder. **The intestine** which occupies most of the **abdominal cavity** is at least ten times as long as the cavity itself. It shortens as the tadpole changes into the frog. The colour of the animal changes as it develops, passing from black to a soft olive-green. Frogs grow for several years before they can be said to be fully developed.

THE FROG.

Requirements.—A live, full-grown frog in a glass case; also a large picture of an adult frog. A toad for comparison.

Subject Matter.	Method.
Structure.—	
1. *Skin.*—Generally yellowish, with darker markings; but variable. Moist and cold.	1. Compare the rough, warty skin of the toad.
2. *Back.*—Apparently humped.	2. Explain that the back-bone is straight, and that the hump is due to the projecting hip-bones.
3. *Legs.*—Fore legs short; with four toes, turned inwards. Hind legs long, powerful, and web-footed.	3. Explain that the legs, being unequal, are not adapted for walking; but that the hind legs are suited for jumping.
4. *Eyes.*—Large, prominent, bright; eyeballs retractile.	4. Touch the eyeball lightly, and observe how it is pulled in.
5. *Ears.*—Black oval patches (drums of the ears) behind the eyes. No external appendages.	5. Compare with the human ear, in which there is an external appendage, and in which the drum is at the inner end of a canal.
6. *Nostrils.*—Just above the front of the mouth. Open and shut alternately as the frog breathes.	6. Explain that the nostrils open to let in air, and then close while the air is being driven into the lungs.
7. *Mouth.*—Wide. Always closed except when the frog is feeding. Tongue fastened to the front of the mouth.	7. Compare the tongue with our own, which is directed forwards, while that of the frog is directed backwards when the mouth is closed.
Habits.—	
1. *Nocturnal.*—Avoids the sun, and lives in damp places.	1. Explain that the frog breathes partly by its skin, which could not absorb air if it were dry.
2. *Breathing.*—The floor of the mouth is always rising and falling.	2. This is a kind of pumping action for forcing air into the lungs. The frog cannot breathe with its mouth open.
3. *Jumping and Swimming.*—Jumps and swims well, using its hind legs.	3. Show how the hind legs are peculiarly adapted for such movements.
4. *Feeding.*—The frog catches its smaller prey by means of its sticky tongue. Larger prey, such as large insects and worms, caught in the jaws, and helped into the mouth by the fore feet.	4. Show how the tongue is especially adapted for catching small insects, being very extensile, and fastened in front of the mouth.
5. *Hibernation.*—The frog hibernates (sleeps through the winter) in damp places.	5. Name other hibernating animals.

NOTES FOR COMPOSITION LESSONS

(Pupil's Composition Book, p. 9.)

I. Oral Work.

(1) Direct the attention of the class to the picture in their composition books.

(2) Question them regarding it.

(3) Insist upon each answer being given in the form of a complete sentence.

(4) Write down the answers on the black-board, and underline the words to be noted for spelling.

BLACK-BOARD

A. (1) The frog has *four legs*.
(2) Its *hind* legs are *longer* than its *front* legs.
(3) The frog *jumps* with its hind legs.

B. (1) The frog's hind feet have *skin between* the *toes*.
(2) This helps it to *swim* in the *water*.
(3) The frog's hind legs are *doubled* up.

C. (1) The frog has *large eyes*.
(2) The frog has a wide *mouth*.
(3) The frog has large eyes and a wide mouth.

II. Spelling.

(1) Copy the underlined words on black-board.

(2) Draw attention to the long *i* sound in *hind*, and let children supply other words ending in *-ind*, as *find*, *bind*, *grind*, &c.

(3) Treat other words similarly and group on black-board.

(4) Compare the different sounds of *ou* in *doubled* and *mouth*, and carry on the comparison by other words, as *touch* and *south*, *could* and *couch*, &c.

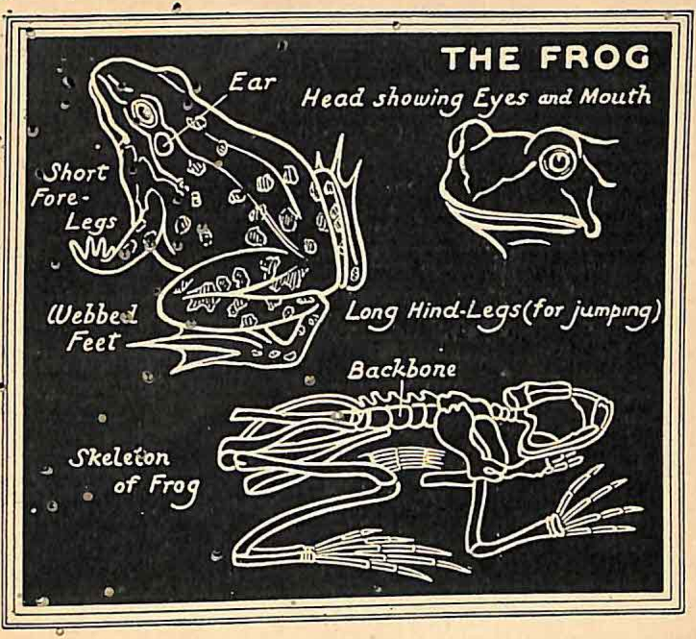
(5) Draw attention to the silent *ue* in *tongue*.

(6) Let children copy words on their slates.

III. Written Tests.

(1) Clean the black-board. Arrange the children in groups A, B, C, to write the exercise with the corresponding letter.

(2) Correct carefully.



Black-Board Summary.

Structure.—

1. *Skin.*—Moist and cold.
2. *Back.*—Humped.
3. *Legs.*—Fore legs short. Hind legs long, with webbed feet.
4. *Eyes.*—Large.
5. *Ears.*—Behind eyes.
6. *Nostrils.*—Above mouth.
7. *Mouth.*—Wide. Closed.

Habits.—

1. Out at night.
2. Breathes with mouth shut.
3. Jumps and swims.
4. Catches insects with its tongue.
5. Sleeps during the winter.

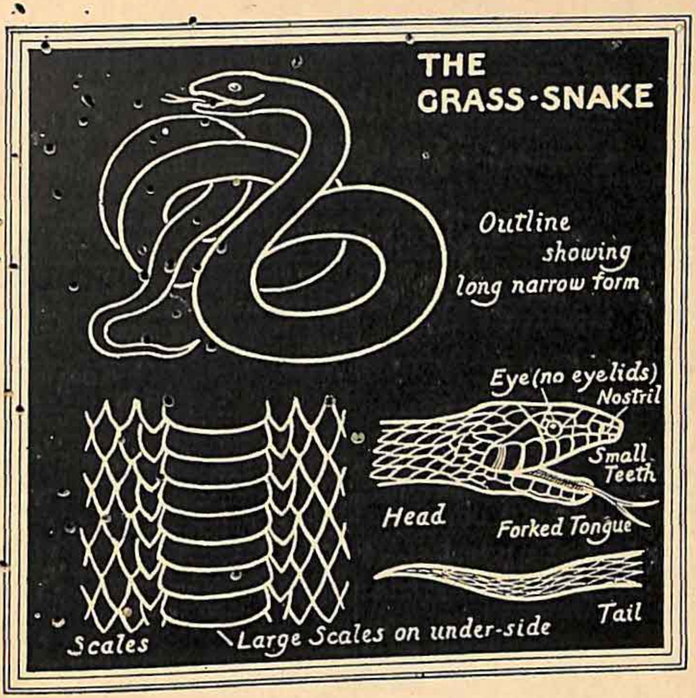
NOTES FOR THE TEACHER.

Frogs are **amphibians** of the family **Ranidæ**, a family which includes some **eighty** species. The common frog is of a **greenish-brown**, **yellowish**, or **reddish** colour, with oblong brown spots behind the eyes and brown cross-bars on legs. The noise it produces by the expulsion of the air from its lungs is called **croaking**. In the case of the **edible frog**, the male is furnished with vocal sacs which increase the resonance of the voice. The skin of the frog plays an important part in the **aeration** of the blood. **Frogs** have been kept for weeks in vessels under water charged with air, and **Toads**, which are closely akin to Frogs, have been kept alive for months in nets under running water.

A SNAKE

Requirements.—This lesson should be illustrated by a live grass snake, which may be obtained at a naturalist's shop if it cannot be caught in the neighbourhood. Enlarged diagrams of the tongue, scales, &c., may be useful. A cast skin should also be obtained.

Subject Matter.	Method.
Structure.—	
1. *Form.*—Long, narrow, tapering at the tail. Neck narrow.	1. Show that its form enables it to creep into small holes, and among thick bushes.
2. *Scales.*—Skin covered with overlapping scales, with free edges turned backward. Transparent, allowing the colour of the skin beneath to be seen.	2. Show how the scales are arranged. Illustrate by overlapping slates.
3. *Eyes.*—Bright. No eyelids.	3. Explain that the eyes cannot be closed, but are protected by a transparent horny scale.
4. *Nostrils.*—Above the front of the mouth.	4. Show that the mouth of the snake is usually shut. It breathes through its nostrils.
5. *Mouth.*—Very large. Teeth very small; tongue long and forked to about one-third of its length.	5. The mouth of a tame snake may be easily opened to show teeth.
Habits.—	
1. *Movements.*—It glides about, and climbs. It swims somewhat like an eel, and is very fond of the water.	1. Explain how it pushes itself along by the edges of its scales, the scales being moved by the ribs.
2. *Motion of the tongue.*—The tongue is constantly thrust out and vibrated as the snake creeps.	2. Explain that the tongue is used as a feeling organ. It is not a weapon.
3. *Defence.*—The grass snake is quite harmless. It hisses to scare its foes, and also protects itself by casting out a fluid which has a very unpleasant odour.	3. Note how the body alternately swells and contracts as the snake hisses. A tame snake seldom hisses or causes an unpleasant odour.
4. *Feeding.*—The snake feeds on frogs, and occasionally other small animals. It swallows its prey whole and alive.	4. Explain that the teeth are not capable of biting or masticating, but simply serve to hold the prey.
5. *Hibernation.*—It hibernates in dry holes.	



BLACK-BOARD SUMMARY.

Structure.—
1. *Form.*—Long, narrow.
2. *Scales.*—Overlap.
3. *Eyes.*—Without eyelids.
4. *Nostrils.*—Above mouth.
5. *Mouth.*—Very large. Small teeth. Forked tongue.

Habits.—
1. Glides and climbs.
2. Thrusts out its tongue.
3. Hisses.
4. Swallows its prey whole.
5. Sleeps all the winter.

NOTES FOR THE TEACHER.

The common snake or grass snake belongs to the family **Colubridæ**, a family which comprises between two and three hundred kinds of non-venomous snakes. The **head** is small, but easily distinguished from the neck. It swims with ease, and frequents ponds where frogs and sometimes fish are to be caught. It is therefore often called the **Water-Snake**. Besides frogs and small fish, it feeds also on birds, birds' eggs, mice, and lizards. It **casts its skin** twice or three times in the summer according to the temperature and the rate of growth. After a meal it remains inactive for several days.

THE HERRING.

Requirements.—A fresh herring. Enlarged drawing of scales, gills, and fins.

Subject Matter.	Method.
Structure.—	
1. *General Form.*—Thick in the middle. Tapers at both ends.	1. Show that this form admits of easy progress in the water. Compare with a boat.
2. *Scales.*—Cover the body. Overlap. Very smooth.	2. Explain that the smooth surface also reduces friction.
3. *Fins.*—Each one consists of rays, with a thin membrane between them. One on the back, a pair behind the head, another pair near the vent, the tail fin, and a medial fin under the tail.	3. Let the children examine the fins, and note the number and arrangement.
4. *Gills.*—Situated under the gill covers, on each side of the head. Note the bright-red colour.	4. Explain that the gills are the breathing organs. Compare the gill-breathing with lung-breathing animals.
5. *Teeth.*—Very small, but sharp.	5. Let the children pass their fingers over the teeth, as well as look at them.
Habits.—	
1. *Swimming.*—A live gold-fish or other fresh-water fish may be exhibited if it is desired to show how the fins are used. In this case the use of the tail as a rudder may be pointed out.	
2. *Breathing.*—A fish breathes by taking water into its mouth, and passing it out under the gill covers. This water bathes the gills, which absorb air from it; and the air passes into the blood.	2. Explain that a gill-breathing animal can obtain its supply of air only from water; hence a fish soon dies if taken out of water.

NOTES FOR COMPOSITION LESSONS

(Pupil's Composition Book, p. 11.)

I. Oral Work.

(1) Direct the attention of the class to the pictures in their composition books.

(2) Question them regarding each picture.

(3) Insist upon each answer being given in the form of a complete sentence.

(4) Write down the answers on the black-board, and underline the words to be noted for spelling.

BLACK-BOARD

A. (1) The herring is a *fish*.

(2) The herring is *caught* in the *sea*.

(3) The herring is a fish, and is caught in the sea.

B. (1) The herring's body is *covered* with *scales*.

(2) The herring's body is *very narrow* at the *tail*.

(3) The herring's body is covered with scales, and is very narrow at the tail.

C. (1) The herring's *gills* are on *each side* of its head.

(2) *Water* runs in at its *mouth* and out at its gills.

(3) The herring *swims* with its *fins*.

D. (1) The herring's tail is a *large fin*.

(2) It *moves* its tail from *side to side* to *steer through* the water.

II. Spelling.

(1) Write out the underlined words on the black-board.

(2) Question children for list of words ending in *-ish*, as *wish*, *dish*, *fish*.

(3) Treat other words in the same way, to form groups.

(4) Note the silent *gh* in *caught*. Give other examples, as *taught*, *fought*, &c.

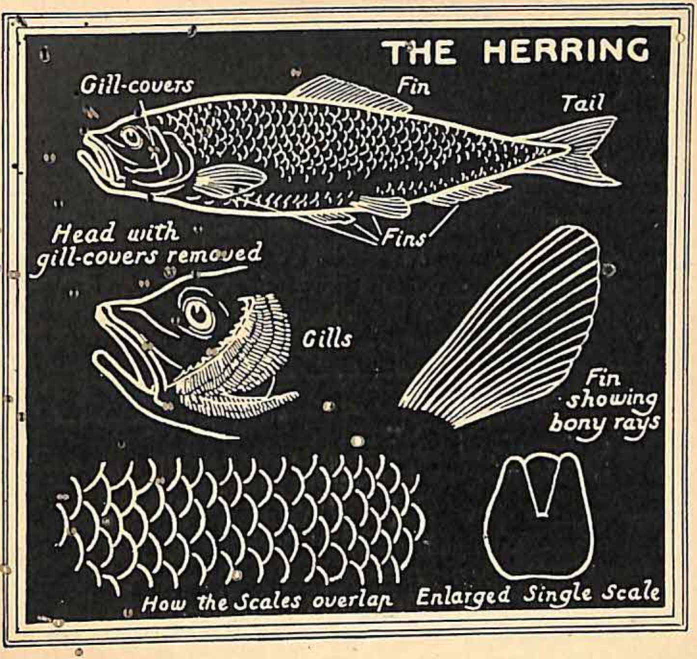
(5) Draw attention to the long *u* sound of *ough* in *through*.

(6) Let children copy words on slates.

III. Written Tests.

(1) Clean the black-board. Arrange the children in groups A, B, C, D, to write the exercise with the corresponding letter.

(2) Correct carefully.



Black-Board Summary.

Structure.—

1. *Form.*—Tapers in front and behind.
2. *Scales.*—Overlap, smooth.
3. *Fins.*—Two pairs, and three others.
4. *Gills.*—Behind head. Red.
5. *Teeth.*—Very small, but sharp.

Habits.—

Swims by means of its fins.
Breathes by its gills.

NOTES FOR THE TEACHER.

The **Herring** belongs to the important family of the **Clupeidæ**, a family which includes among its 150 species, besides the herring, the **Anchovy**, the **Sprat**, the **Shad**, and the **Pilchard**. The herring is widely distributed on both sides of the North Atlantic. It feeds chiefly on small crustacea; but many kinds of small fish have been found in its stomach. It deposits its **spawn**, which adheres to the rocks, on the sea bottom. In a fortnight or three weeks the fish are abundant, and in six weeks they are three inches long. The herring is **migratory**, but nothing certain is known as to the course of its migration.

CATERPILLARS.

Requirements.—A diagram, illustrating the metamorphoses of a caterpillar, will be necessary while giving this lesson; but the changes should be studied from the insects themselves.

The eggs and the young caterpillars of the common cabbage-butterfly may be found in any vegetable garden, on the leaves of cabbages, during April and May, and again about two months later (the second brood). The caterpillars may be fed on cabbage leaves, and observed from day to day.

Subject Matter.	Method.
Eggs.— Laid by butterflies on the proper food-plants. Attached by a gummy substance.	Exhibit a cluster of the eggs, and also a picture of the egg as seen through a microscope.
Caterpillar.—	
1. *Structure.*—Body made up of several segments, the number usually given as thirteen, counting the head as the first.	1. The structure of a caterpillar should be illustrated by diagrams or black-board sketches; but live caterpillars should also be exhibited.
2. *Head.*—Covered with a hard skin. A pair of jaws. Twelve very small eyes.	2. If the caterpillar of the cabbage-butterfly cannot be obtained, any other will do, for all are similar in their general characteristics, except that the number of claspers varies from two to five pairs.
3. *Limbs.*—Six legs—one pair on each of the 2nd, 3rd, and 4th segments. In addition to these legs, the caterpillar has five pairs of pro-legs, each one provided with a circlet of little hooks. The pro-legs are often spoken of as the claspers.	
4. *Moulting.*—A caterpillar casts its skin several times during its growth. The old skin splits, and reveals a new one beneath.	4. The process of moulting should be observed if possible. The approach of moulting-time may be known by the temporary fasting of the insect.
5. *Final Moult.*—This occurs when the caterpillar is full grown, and the insect then appears as a chrysalis.	5. A chrysalis should be exhibited, and, if possible, the final moulting watched at intervals.

NOTES FOR COMPOSITION LESSONS

(Pupil's Composition Book, p. 13.)

I. Oral Work.

(1) Direct the attention of the class to the pictures in their composition books.

(2) Question them regarding each picture.

(3) Insist upon each answer being given in the form of a complete sentence.

(4) Write down the answers on the black-board, and underline the words to be noted for spelling.

BLACK-BOARD

A. (1) *Caterpillars* are like *tiny grubs.*

(2) They come from the *eggs* of the *butterfly.*

(3) Caterpillars are like tiny grubs, and come from the eggs of the butterfly.

B. (1) The caterpillar has a *soft body.*

(2) It can *bend* its body *easily.*

(3) The caterpillar has a soft body, and can bend its body easily.

C. (1) The caterpillar *feeds* on the *cabbage leaf.*

(2) It *creeps about* the leaf with its tiny legs.

(3) The caterpillar makes *holes* in the cabbage leaf.

D. (1) The caterpillar *changes* into a *chrysalis.*

(2) It changes *afterwards* into a *butterfly.*

(3) The caterpillar changes into a chrysalis, and afterwards into a butterfly.

III. Spelling.

(1) Copy the underlined words on black-board.

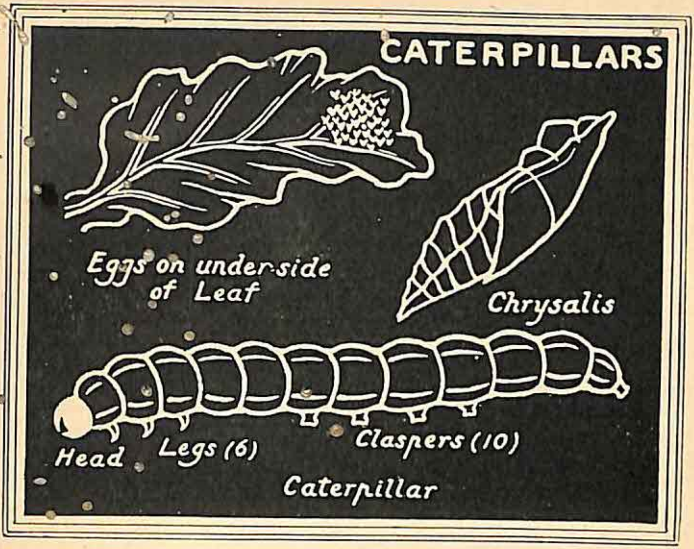
(2) Build up the words *caterpillar*, *butterfly*, *cabbage*, *afterwards*, *chrysalis* syllabically, to teach proper pronunciation. The word *chrysalis* being exceptionally difficult, should be written several times by the children and afterwards used for a writing lesson, in order to impress it on their minds.

(3) Let children copy words on slates.

III. Written Tests.

(1) Clean the black-board. Arrange the children in groups A, B, C, D, to write the exercise with the corresponding letter.

(2) Correct carefully



BLACK-BOARD SUMMARY.

Eggs.—

Laid by butterfly.

Caterpillar.—

1. *Body.*—Of several parts.
2. *Head.*—Hard. With two jaws and twelve eyes.
3. *Limbs.*—Six legs. Claspers.
4. *Moulting.*—Casts its skin several times.
5. *Change.*—Changes to a chrysalis.

NOTES FOR THE TEACHER.

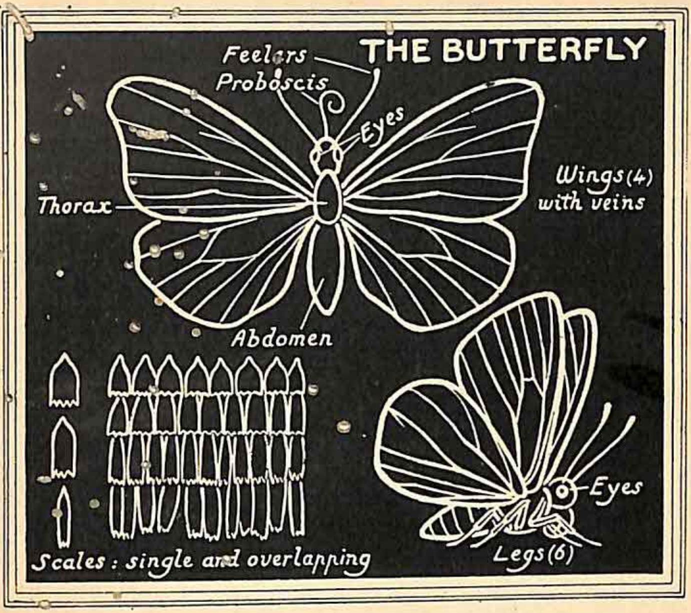
The **eggs** of butterflies are interesting microscopic objects, as they are usually covered with a **hard shell**, and are of various shapes and colours. The majority of insects pass through a regular series of changes. The "young" on escaping from the egg is known as the "**larva**". The "**larvæ**" are soft creatures, with the body in segments, not unlike earthworms. When they have no distinct head and no limbs they are called **maggots**; when they have a horny head and no limbs, or only jointed legs, they are known as **grubs**; and when they are furnished with **head**, jointed legs, and pro-legs, they are called **caterpillars**. After the final moult the larva passes into the "**pupa**" state, and is sometimes known as a chrysalis. Before taking this form the larva usually selects some shelter, and very often also makes for itself a protective case or "**cocoon**". After a period of quiet it issues from the shelter as the "**imago**", or adult insect, furnished with wings.

A BUTTERFLY.

Requirements.—The chrysalides exhibited in the last lesson should be preserved till the butterflies appear. These may then be employed for the illustration of the present lesson. If possible, the children should watch the perfect insect emerging from the pupa-case. The scales from the wing may be exhibited with the aid of a microscope.

Subject Matter.	Method.
Structure.—	
1. *Body.*—In three parts—head, thorax, and abdomen.	1. Point out that this division is not so apparent in the caterpillar.
2. *Head.*—With two feelers (*antennæ*), usually thickened into a knot at the end, two large compound eyes, and a sucking-tube (*proboscis*).	2. Compare with the head of the caterpillar. Note differences.
3. *Thorax.*—Bears three pairs of legs and two pairs of wings.	3. Show that this corresponds with the leg-bearing segments of the caterpillar.
4. *Abdomen.*—Covered with fine hairs. No limbs.	4. Point out that the claspers of the caterpillar have disappeared.
5. *Legs.*—Six in number. Of several parts, jointed together, and terminating in two hooked claws.	5. Compare with the short legs of the caterpillar.
6. *Wings.*—Four. Large. Membrane, supported by rigid "veins" or rays, and covered with minute scales.	6. Explain that the wings are imperfectly formed in the chrysalis, but develop when the perfect insect emerges.
Habits.—	
1. *Flight.*—Rapid but jerky.	1. Contrast with the flight of birds.
2. *Feeding.*—Sucks the sweet juices from flowers by means of the proboscis, which can be extended, and when not in use is coiled up.	2. Compare with feeding of the caterpillar, which bites solid food.
3. *Egg-laying.*—Eggs laid by butterfly on the food-plants of the caterpillar.	3. Recapitulate briefly the whole life-history—from egg to perfect insect.

NORMAL SCHOOL
CALCUTTA
VERNACULAR



BLACK-BOARD SUMMARY.

Structure.—

1. *Body.*—In three parts.
2. *Head.*—Eyes, feelers, sucking-tube.
3. *Second part.*—Legs and wings.
4. *Third part.*—No limbs.
5. *Legs.*—Six. Claws.
6. *Wings.*—Four. Covered with scales.

Habits.—

1. *Flight.*—Jerky.
2. *Feeding.*—Sucks juices of flowers.
3. *Lays eggs.*—Eggs produce caterpillars.

NOTES FOR THE TEACHER.

The **butterfly** is one of the "**Lepidoptera**" or scale-winged insects. Besides butterflies, of which it is reckoned that there are 10,000 different kinds, this order includes the **moths**, of which it is estimated that there are 40,000 species. In the British Isles, of 2000 different kinds of Lepidoptera, only 65 are butterflies and the rest moths. The body is almost completely covered with **hair** or **scales**, and the insects feed on the **honey of flowers**, **honey-dew**, the **sap** of trees, **over-ripe fruit**, &c. Their senses are very keen. Some varieties owe their safety to an odour which they emit, and which repels their enemies. These are numerous. In many cases the butterfly imitates so completely the objects about it, leaf or twig, that it escapes the notice of its foes.

SPIDERS.

Requirements.—This lesson should be given in the summer, while garden spiders are to be seen in plenty. If a spider be placed in a very large bottle, with a few pieces of twig, and the mouth of the bottle covered with gauze, the spinning of the web may be watched.

Subject Matter.	**Method.**
Structure.—	
1. *Body.*—In two parts. (Head and thorax combined into one.) Female larger than male.	1. Compare with the body of the butterfly. Show that the spider is not an insect. Point out all the different features in which spiders differ from insects, of which the butterfly may be taken as a type.
2. *Front part.*—(Head and thorax.) Eight small eyes. Powerful jaws. Eight legs. No wings. Legs, of several parts jointed together. Hooked claws.	
3. *Hind part* (*abdomen*).—In several segments. No limbs. Spinnerets.	3. Show that the butterfly has no spinnerets, and that the spinneret of the caterpillar is in the front of the head.
4. *Spinnerets.*—At the tip of the abdomen. Each one has a gland which secretes a sticky fluid.	
Habits.—	
1. *Web-spinning.*—Spinnerets have a number of little holes. The fluid from the gland passes out through these in the form of so many exceedingly fine silk threads. All these little threads unite to form one thicker one. The spider applies its spinnerets to a surface, then draws its body away. Thus the thread is formed, and becomes solid almost immediately on exposure to air.	1. The building of the web should be watched by the children; and the observation should be conducted out of doors if possible, for there the web would be spun under normal conditions, and therefore be of the usual form and size.
2. Surrounds its eggs by a cocoon of silk.	2. Show the cocoon full of eggs.
3. Spiders do not undergo changes in form as they grow.	3. Give this as another distinction between spiders and insects.
4. Very voracious. Feeds on flies. The web a snare.	

NOTES FOR COMPOSITION LESSONS

(Pupil's Composition Book, p. 15.)

I. Oral Work.

(1) Direct the attention of the class to the pictures in their composition books.

(2) Question them regarding each picture.

(3) Insist upon each answer being given in the form of a complete sentence.

(4) Write down the answers on the black-board, and underline the words to be noted for spelling.

BLACK-BOARD

A. (1) The spider has *two parts* to its *body*.
(2) The spider has *eight legs*.
(3) The spider has two parts to its body and eight legs.

B. (1) The spider's legs have *stiff hairs*.
(2) The spider's legs have *sharp claws*.
(3) The spider's legs have stiff hairs and sharp claws.

C. (1) The spider *spins* its web.
(2) The spider's web is *pretty*.
(3) It is made of *fine silk threads*.

D. (1) The spider *catches flies* in its web.
(2) It *eats* them.
(3) The spider catches flies in its web and eats them.

II. Spelling.

(1) Write out the underlined words on black-board.

(2) Draw children's attention to the long *a* sound of *eigh* in *eight*, and give other examples, as *neigh*, *weigh*, *weight*.

(3) Treat the short *e* sound of *ea* in *threads* in same way; *lead*, *read*, *bread*, &c.

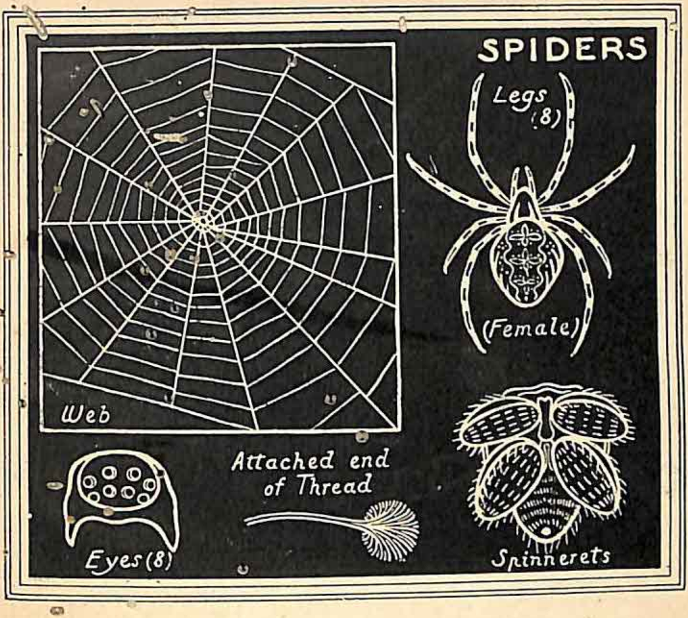
(4) Let children supply lists of words to group with *catch*, *silk*, &c.

(5) Let children copy words on their slates.

III. Written Tests.

(1) Clean the black-board. Arrange the children in groups A, B, C, D, to write the exercise with the corresponding letter.

(2) Correct carefully.



Black-Board Summary.

Structure.—

1. *Body.*—Two parts.
2. *Front part.*—Eight eyes. Jaws. Eight legs.
3. *Hind part.*—Spinnerets. No limbs.
4. *Spinnerets.*—At tip of abdomen.

Habits.—

1. Spins webs.
2. Surrounds eggs with silk.
3. No changes.
4. Feeds on flies.

NOTES FOR THE TEACHER.

Spiders and scorpions, &c., form a division of the **Arthropoda** closely resembling the **Crustaceans**, and known as **arachnids**. As a rule the front part of the body (*cephalo-thorax*) is covered by a more or less horny plate. Connected with the mouth are the "**falces**", a pair of jointed claws, which, being opposed to each other, form a biting organ, and having a duct connected with a poison gland at their base opening into their tip, are truly formidable weapons; a pair of pointed **feelers** (*maxillæ*); and a "**labium**" or lower lip. There are from two to four pairs of **spinnerets**, near the end of the abdomen. The first joint of each of these is furnished with a very minute horny tube, the spinning-tube or "**spinnerale**". By means of these, spiders form the silky thread with which they make their dwellings, prepare snares for their prey, guard themselves against falling, and transport themselves through the air.

THE SNAIL.

Requirements.—A few live snails. A cabbage leaf. Some empty shells. Snail's eggs and young if possible. (The eggs are to be found under stones, &c.) Also a rasp.

Subject Matter.	Method.
Structure.—	
1. *Shell.*—Spiral. Small at the top. Larger and larger towards the mouth. Mouth large, with a curved rim.	1. Pass several empty shells round the class. Let each child examine one.
2. *Body.*—Very soft. No inside skeleton. Attached to the shell within, but may be protruded considerably.	2. Let the snail be examined as it crawls on a leaf.
3. *Skin.*—Soft, slimy, wrinkled.	3. Observe the slimy track formed as the snail moves.
4. *Head.*—Four horns. Two longer and two shorter. Retractile. Eyes at the tips of the longer horns. Mouth on under side of head.	4. Let all these structures be seen by each child. The mouth may be seen as the snail crawls on a piece of glass. Look through the glass.
Habits.—	
1. *Creeping.*—Creeps on the under surface of its body.	1. Let the snail creep on a piece of glass. The wave-like contraction of the under surface may be seen through the glass.
2. *Breathing.*—Breathes by means of a lung.	2. The breathing opening may be seen on the right side of the body.
3. *Feeding.*—Rasps away its food (vegetable matter) with the numerous small teeth of its "tongue".	3. In a very quiet room the rasping of the food may be heard on putting the ear very close. Show a rasp.
4. *Hibernation.*—Sleeps all through the winter. Closes its shell with a film of slime, which soon hardens.	4. This covering is often formed during temporary repose in summer—especially in a dry season. It should be shown.

NOTES FOR COMPOSITION LESSONS

(Pupil's Composition Book, p. 17.)

I. Oral Work.

(1) Direct the attention of the class to the pictures in their composition books.

(2) Question them regarding each picture.

(3) Insist upon each answer being given in the form of a complete sentence.

(4) Write down the answers on the black-board, and underline the words to be noted for spelling.

BLACK-BOARD

A. (1) The snail has *four horns*.
(2) The two *longer* horns have *little knobs* on the ends.
(3) These little knobs are *eyes*.

B. (1) The snail has a *soft body*.
(2) The snail has a *slimy skin*.
(3) The snail has a soft body and a slimy skin.

C. (1) The snail *crawls* along.
(2) The snail *carries* its *shell* on its back.
(3) The *eggs* of the snail are *round*.

D. (1) The snail can *draw* its *horns* into its head.
(2) The snail *draws* its *body* into its shell when it is *afraid*.
(3) The snail *sleeps* in its shell.

II. Spelling.

(1) Write out the underlined words on black-board.

(2) Draw attention to the silent *k* in *knobs*. Give other examples of the silent *k*, as *knife*, *knot*, *knell*.

(3) Show how *carries* is got from *carry*. Compare *marry*, *marries*; *copy*, *copies*. Take one or two examples of singular nouns ending in *y* with their plural forms, as *lady*, *ladies*; *body*, *bodies*.

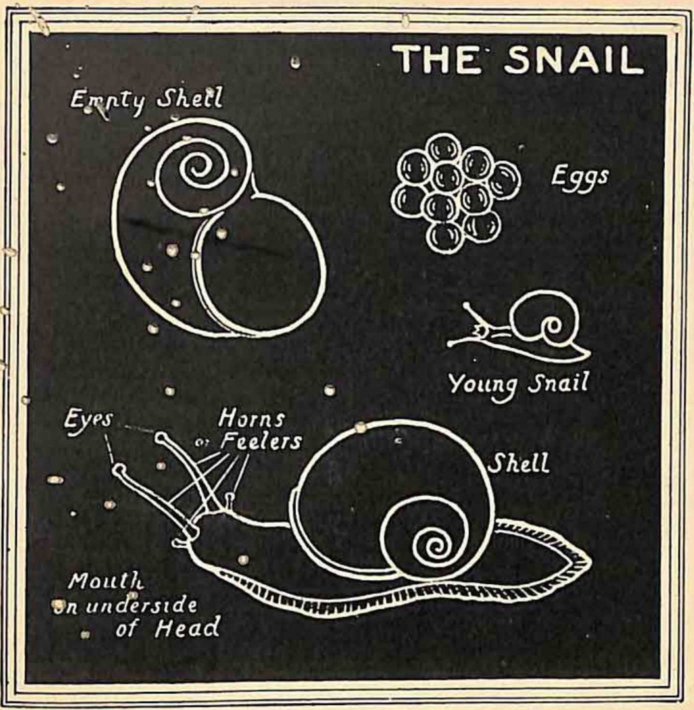
(4) Get children to supply words like *crawls*, as *drawls*, *awls*, *bawls*, &c.

(5) Let children copy words on their slates.

III. Written Tests.

(1) Clean the black-board. Arrange the children in groups A, B, C, D, to write the exercise with the corresponding letter.

(2) Correct carefully.



BLACK-BOARD SUMMARY.

Structure.—

1. *Shell.*—Spiral. Mouth large.
2. *Body.*—Soft. No skeleton.
3. *Skin.*—Soft. Slimy.
4. *Head.*—Horns. Eyes. Mouth.

Habits.—

1. *Creeping.*—On under side of body.
2. *Breathing.*—By a lung.
3. *Feeding.*—Rasps its food.
4. *Sleeping.*—All the winter.

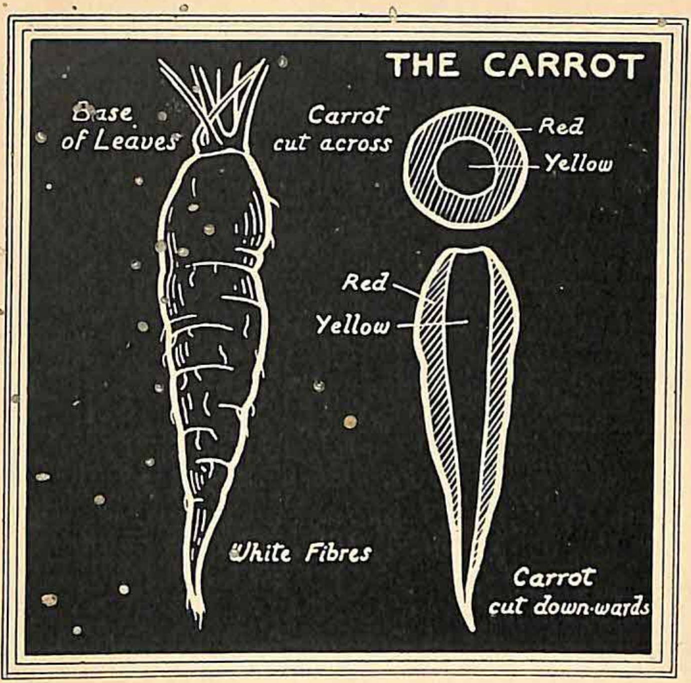
NOTES FOR THE TEACHER.

The garden-snail is a mollusc of the family **Helicidæ** and has a well-developed **external shell** into which the animal can wholly withdraw itself. The shell is generally **coiled to the right**. The body consists of three principal parts —a **head**, a **foot**, and a **part** containing the heart, a well-marked stomach, the intestines, the lung, &c. The **breathing opening** is on the right side, beneath the edge of the shell. The body is **unsymmetrical**. The **mouth**, often curiously twisted, has a strong, horny **upper jaw**.

THE CARROT.

Requirements.—A carrot. Other roots for comparison. Red and yellow cards.

Subject Matter.	Method.
General Characters.—	
1. *Form.*—Conical. Rounded at the top. Terminating below in a fine fibre.	1. Compare with other roots.
2. *Fibres.*—White. Fine. Grow out from the sides and the tip.	2. Note that parts of plants that grow under the ground are frequently white.
3. *Leaf-stalks.*—Arise from the base of the cone. Green.	3. Show that parts of plants above the ground are usually green; due to the action of light.
4. *Substance.*—Brittle. No fibres within. Juicy.	4. Compare with tough, fibrous roots.
5. *Colour.*—Yellowish red.	5. Roots usually white (see note 2). Compare colour with that of red and yellow cards. (The carrot may be drawn and described by the class after the lesson.)
Uses.—	
1. To fix the plant in the soil.	1. Illustrate by means of other roots.
2. To absorb plant-food from the soil. Food absorbed by the root-threads.	2. Explain that plants feed only on liquids and gases. These are absorbed from the soil.
3. It stores up food. This food is of use to the plant itself. It also forms food for us.	3. Explain that the carrot is a mass of food, from which leaves and flowers grow. Prove this by cutting off the top of a carrot, and standing it in a saucer of water. Leaves soon grow.



BLACK-BOARD SUMMARY.

General Characters.—
1. *Form.*—Tapering.
2. *Fibres.*—White.
3. *Leaf-stalks.*—Green.
4. *Substance.*—Brittle. Juicy.
5. *Colour.*—Yellowish red.

Uses.—
1. To fix plant.
2. To absorb food.
3. Stores up food.

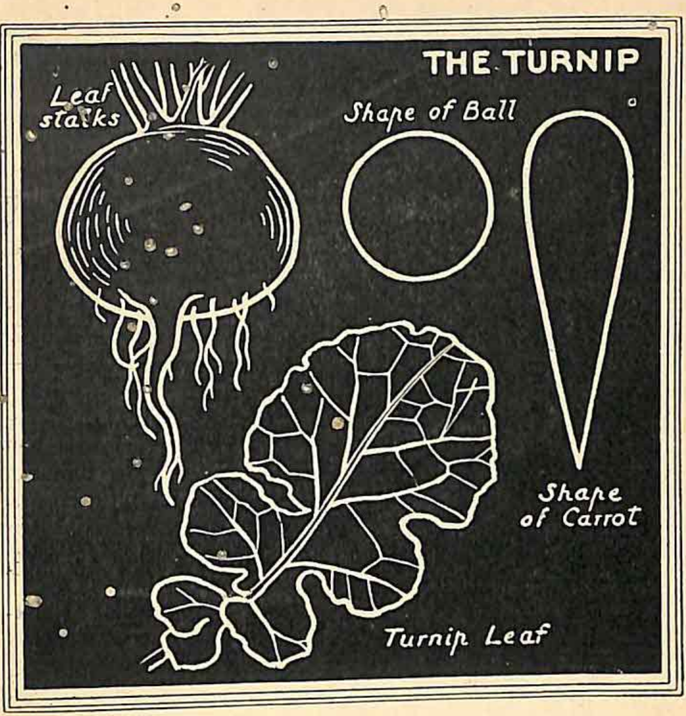
NOTES FOR THE TEACHER.

The carrot is a **biennial**. Its life is divided into two stages. In the first stage nearly the whole of the **vegetative work** is carried on, with the result that a stock of **nutritive material** is accumulated, which is used in the next stage for the production of blossoms and **seeds**. In the second stage the flower and the seed are rapidly produced, and the store of nutriment being used up, the plant dies. Plants like the carrot are carefully cultivated by man, that he may turn to his own uses the store of nutriment which they lay up in the first stage.

THE TURNIP.

Requirements.—A turnip plant. A carrot and other roots for comparison. A knife.

Subject Matter.	Method.
General Characters.—	
1. *Form.*—Almost globular. Tapering below. Terminating in a long thin fibre.	1. Compare with a ball; also with a carrot.
2. *Fibres.*—White. Chiefly on and near the tapering portion at the bottom.	2. Compare with the fibres of the carrot, and also with those of other roots.
3. *Leaves.*—Green. Very irregular in form. Some hairy, some smooth. Leaf-stalks start from the top of the root.	3. Let all children examine the leaves, noticing the shape, surface, and origin.
4. *Substance.*—Soft, juicy, and without fibres. Sometimes turnips have fibres within: then tough and "stringy".	4. Compare with the carrot—more juicy: less brittle. Also compare with tough, fibrous roots.
5. *Colour.*—Purple or green above (the part exposed to light as it grows), and white below.	5. Explain that the colour is due to the action of light. The root and a leaf may be drawn and described by the class.
Uses.—	
1. To fix the plant in the soil.	1. Illustrate as in the last lesson.
2. To absorb plant-food.	2. Explain the nature of plant-food as in the last lesson.
3. Stores up food for the plant. The food stored is also good for ourselves.	3. The use of the stored food may be illustrated by an experiment, as in the last lesson.



BLACK-BOARD SUMMARY.

Structure.—
1. *Form.*—Round.
2. *Fibres.*—White.
3. *Leaves.*—Some hairy.
4. *Substance.*—Juicy.
5. *Colour.*—White, purple or green above.

Uses.—
1. To fix the plant.
2. To suck up food.
3. Stores up food.

NOTES FOR THE TEACHER.

The turnip, like the carrot, is a **biennial**. It vegetates during the first season, storing up food in the root. During the second season it blossoms and produces seed, and, having in this way used up its food-supply, dies. It is widely cultivated as a **culinary** vegetable, and as a **food** for cattle and sheep. The root is a **tap-root**, and is said to be **napiform**, that is turnip-shaped.

THE POTATO-PLANT.

Requirements.—A complete potato-plant, with tubers, flowers, and fruit.

Subject Matter.	Method.
1. **Stem.**—Three kinds of stems.	1. Show the three kinds of stems.
(*a*) Green stems above the soil. Tough and fibrous. Bear the leaves and flowers.	(*a*) Break a green stem to show that it is tough and fibrous.
(*b*) White running stems below the surface of the soil. Give off rootlets.	(*b*) Explain the use of a running stem for gathering food from the soil by means of its rootlets.
(*c*) Tubers, or swollen underground stems, which we eat.	(*c*) Cut a tuber to show that it is not fibrous.
2. **Roots.** — White. Fibrous. Branched. Absorb the plant-food from the soil, and help to fix the plant.	2. Compare with other roots previously examined.
3. **Leaves.**—Green. Oval. Pointed. Midrib running through the middle—a continuation of the stalk. Veins branching from the midrib, and forming a network.	3. Let each child have a leaf for examination and description. (The leaf may afterwards be drawn, and the venation represented.)
4. **Flowers.**—Formed of little leaves arranged in whorls. Central portion of the flower becomes the fruit, and contains the seed.	4. Show the arrangement of the parts in whorls. Point out the pistil, which afterwards develops into the fruit (the potato-apple).

NOTES FOR COMPOSITION LESSONS

(Pupil's Composition Book, p. 19.)

I. Oral Work.

(1) Direct the attention of the class to the pictures in their composition books.

(2) Question them regarding each picture.

(3) Insist upon each answer being given in the form of a complete sentence.

(4) Write down the answers on the black-board, and underline the words to be noted for spelling.

BLACK-BOARD

A. (1) We grow potato *plants* in the *garden*.
(2) The *green stems* grow *above* the ground.
(3) The *white* stems grow *under* the ground.

B. (1) The *leaves* grow on the green stems of the potato plant.
(2) The *potatoes* grow on the white stems.
(3) The *roots* run down *below* the white stems.

C. (1) The *outside* of the potato is called the *skin*.
(2) The *little dents* in the potato are called *eyes*.
(3) A *new* plant can grow out of each eye.

D. (1) The potato draws its food from the *soil through* its *roots*.
(2) The roots of the potato are like *white threads*.
(3) We use potatoes for food.

II. Spelling.

(1) Write out the underlined words on the black-board.

(2) Compare *eaves, leaves, weaves*, &c.

(3) Treat other words in same way, the children giving lists to form groups.

(4) Draw attention to the syllables of the word *potatoes*, to teach the proper pronunciation.

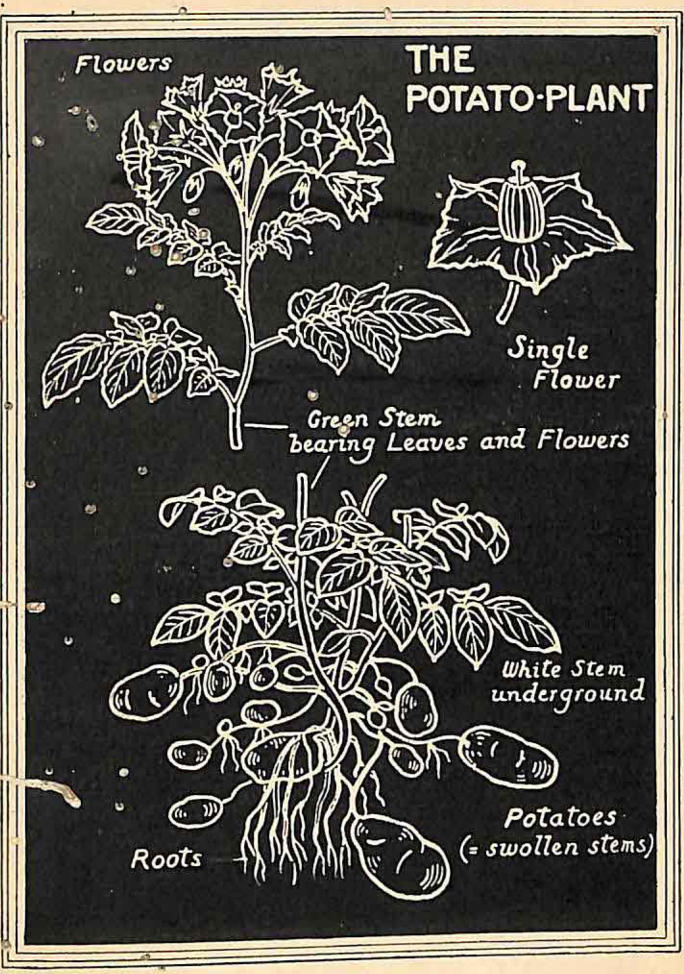
(5) Draw attention to the long *u* sound of *ough* in *through*, and the short *e* sound of *ea* in *threads*; compare *bread*, *dead*, &c.

(6) Let the children copy words on their slates.

III. Written Tests.

(1) Clean the black-board. Arrange the children in groups A, B, C, D, to write the exercise with the corresponding letter.

(2) Correct carefully.


THE POTATO-PLANT
Flowers
Single Flower
Green Stem bearing Leaves and Flowers
White Stem underground
Potatoes (= swollen stems)
Roots

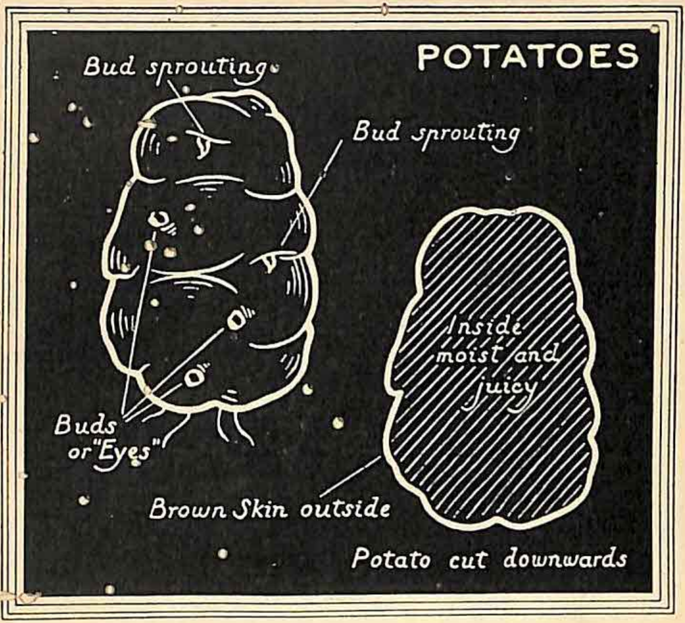
BLACK-BOARD SUMMARY.

1. **Stem.**—Three kinds.
    - (*a*) Green stems.
    - (*b*) White runners.
    - (*c*) Potatoes.
2. **Roots.**—White. Fibrous.
3. **Leaves.**—Green. Veins.
4. **Flowers.**—Form fruit.

POTATOES.

Requirements.—A few potatoes. A knife. A potato that is beginning to sprout. Potato starch.

Subject Matter.	Method.
1. **Structure.**— (*a*) Skin outside. Prevents the potato from getting dry and shrivelled. (*b*) Interior moist and juicy. No fibres. Made up of little cells, containing fluid and starch grains.	1. Cut a potato. Pass round pieces for examination. Show that the inside is soft and brittle, and not tough and fibrous like the green stems of the potato-plant.
2. **Uses.**—The potato is a store of food, from which new potato-plants can grow. Thus useful to the plant. Useful also to us, for we eat the food ourselves.	2. Show that the potato-plant does not store up food for its own use, but in order that new plants may grow.
It yields abundance of starch.	Exhibit potato starch.
3. **A Stem.**—It is regarded as a stem because it has buds. The eyes are buds. A new plant may grow out of each eye, and feed on the store of food till it has roots of its own. The potato cannot itself absorb food from the soil as roots can.	3. Show a potato with developing buds. Explain that a potato may be cut into pieces, and that each piece with an eye will give a new plant. Put aside some pieces in a dark place to grow, and examine them at intervals.



BLACK-BOARD SUMMARY.

1. Structure.—
(*a*) Skin.
(*b*) Soft and moist inside.

2. **Use.**—Stores food, and supplies us with starch.

3. **A Stem.**—Eyes are buds. Do not suck up food as roots do.

NOTES FOR THE TEACHER.

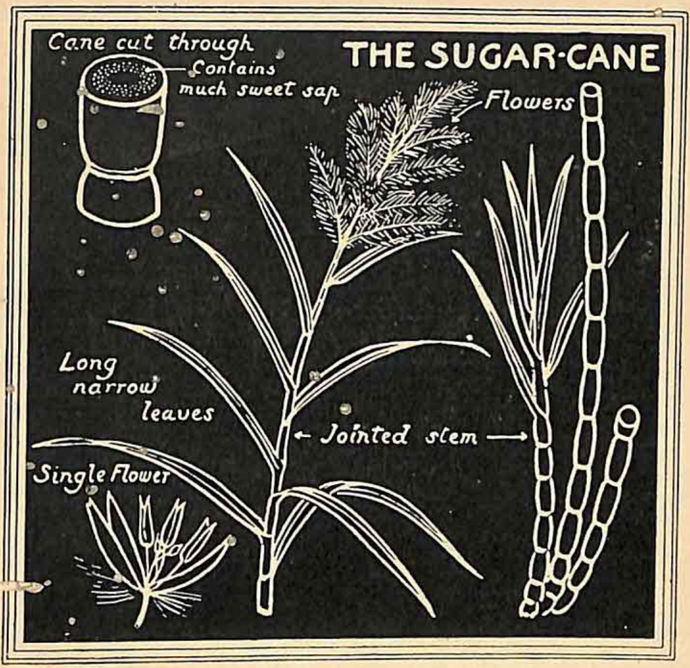
A tuber is really a thickened portion of a **creeping stem** or **rhizome**. The part of the stem that is thickened is usually the end part. It is thickened by having nourishing matter stored up in it, and consists mainly of a mass of cells filled with starch, surrounded by a corky rind.

The potato belongs to the same family as the **night-shade** and the **tobacco-plant**, and like them produces a poisonous alkaloid. The eyes are **axillary** buds, the leaves which subtend them being easily discerned as short scales. From one of these eyes, and the part of the tuber connected with it, a new plant may be grown. The young plant feeds on the nourishment stored up in its piece of tuber until it is strong enough to draw supplies for itself from the soil and the air. The potato is usually grown from the **tubers**, but it can also be grown after some time from the **fruit** or **berry**. Under cultivation the potato has become a very important source of food. Unfortunately the potato is very liable to disease. Among the diseases from which it suffers are scab, dry rot, wet rot, &c.

THE SUGAR-CANE.

Requirements.—A piece of sugar-cane; and, if possible, a leaf, and a spikelet of the flowers. A long stalk of grass, in flower, for comparison. A picture of the sugar plantation, and one of the sugar-mill. Some specimens of raw and refined sugar and molasses. Also an evaporating basin on a stand, water, and a spirit-lamp.

Subject Matter.	Method.
1. **The Cane.**— A very tall grass. Stem thick, jointed, and full of sweet sap. Leaves long and narrow, like large blades of grass, with parallel veins. Large bunches of flowers on the top of the stem. Grows in many warm countries.	1. Show some grass-stalks in flower. Examine the jointed stem, and squeeze out some of the sap. Examine the leaves and flowers, and compare the grasses with the specimens of sugar-cane.
2. **How the sugar is obtained.**— Canes cut when full grown. Then rolled in the sugar-mill to press out the sap.	2. Show picture of sugar-mill, and explain its use.
Sap caught in large pans. It contains dissolved sugar. Sap boiled till it becomes thick. Then allowed to cool. As it cools some of the sugar crystallizes. The remaining liquid (molasses or treacle) poured off. Both sugar and molasses exported.	Make a solution of sugar in water. Evaporate the water till a very thick syrup is obtained. Allow this to cool, and crystals will form. Show specimens of raw sugar and molasses.
The raw sugar is dark, and has to be refined.	Show specimens of refined sugar.



BLACK-BOARD SUMMARY.

1. **The Cane.**—
   A grass.
   Jointed stem.
   Long leaves.
   Flowers.
   Grows in warm countries.

2. **How to obtain the sugar.**—
   Canes cut and rolled.
   Sap boiled; then cooled.
   Crystals formed.

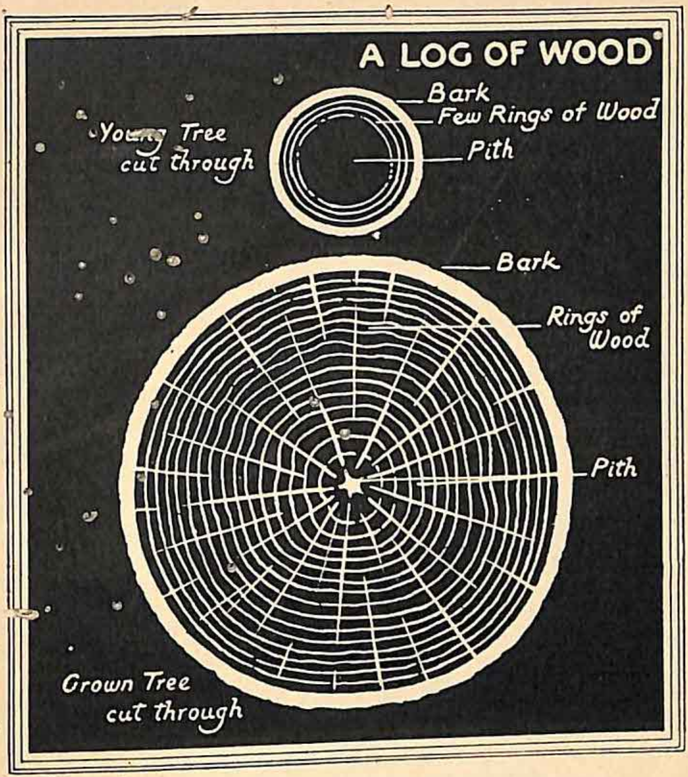
NOTES FOR THE TEACHER.

The **sugar-cane**, one of the grasses, was long the chief source of our sugar-supply; but now much of the sugar of commerce is got from **beet**. The sugar-cane grows to a height of from 7 to 8 or more feet, and has a **smooth, shining stem** and **narrow, ribbed leaves**. It is now chiefly cultivated in the West Indies, Java, Queensland, &c. The stem is **endogenous**. The newer wood bundles in endogenous plants are mingled with the old in various ways, and not formed as in exogens by the formation in the **cambium** of a layer of new wood just outside of the layer last formed. The sugar-cane flowers only after the lapse of an entire year. The flower, as is usual in endogens, is arranged in **threes** or **multiples of threes**, and the veins of the leaves are **parallel**.

A LOG OF WOOD.

Requirements.—A few blocks cut from the branch of a tree—varying in diameter. One end of each may be smoothed and varnished, if necessary, to show the rings, &c., better. Also some young twigs containing much pith.

Subject Matter.	Method.
1. The parts of a log.— (*a*) Bark outside. Protective. Sometimes very rough. Sometimes smooth. (*b*) Wood. Forms greater part of the log. Fibrous. (*c*) Pith. In the centre. Soft. No fibres. Rays from the pith run in all directions.	1. Point out the bark, wood, and pith, in the sections of a branch. Show that wood is tough and fibrous, and that pith is soft and devoid of fibres. Show the pith rays running from the centre of the wood.
2. How a tree grows.— The wood is formed in rings. A very young twig has only one ring of wood. Each summer a new ring of wood is formed outside the older wood, and underneath the bark. The bark is thus pushed outward year by year, and the age of the tree may be calculated by counting the rings.	2. Show the rings of wood in sections of different sizes. Count the rings in each. Show that a young twig has only one or two rings of wood.



BLACK-BOARD SUMMARY.

1. **A Log.**—
   Bark outside.
   Wood tough.
   Pith in centre. Soft.

2. **How a tree grows.**—
   Wood in rings.
   One ring grows each summer.
   Each new ring formed just under the bark.

NOTES FOR THE TEACHER.

In **dicotyledons**, or exogenous plants, the stem consists of the **bark**, the **cambium layer**, the **wood**, and the **pith**. The cambium layer gives rise to a **layer of wood**, which is deposited next the old wood, a **layer of bark** deposited next to the bark, and a new **cambium layer**. The layer of wood deposited grows hard during the winter, and so forms quite a distinct ring from the next layer of wood, which is deposited on the outside of it.

A CABBAGE.

Requirements—A complete cabbage plant with a close heart. A complete cabbage plant in flower, if possible. Cabbage seeds. A knife. Various leaf-buds.

Subject Matter.	Method.
1. **Root.** — Branched. Fibrous. White.	1. Compare with other roots previously examined.
2. **Stem** or **Stalk.**—Thick. Green outside. In part fibrous and tough. In part brittle and without fibres. White within.	2. Examine the stem, cutting and breaking it when necessary. Compare with other stems previously examined.
3. **Leaves.**—Much wrinkled. Midrib thick, running through the middle. Veins branched, forming a network. Leaves not fibrous, but brittle. Outer leaves green. Inner leaves white, and folded closely together, forming a large bud.	3. Let each child examine a leaf, and describe it. Arrangement of veins and absence of fibres to be noted. Explain that the parts eaten have no fibres, and are therefore soft. Make a longitudinal section of the cabbage, to show how the leaves are folded. Compare with other leaf-buds.
4. **Flowers.** — If the cabbage is allowed to remain in the ground for a long time, the bud opens and forms a tall, green, branched stem, bearing yellow flowers. The seed-vessels are formed from the central part of the flowers. The seeds produce new plants.	4. Exhibit a cabbage plant in flower, and let the flowers be examined by the children. (The cabbage in flower may be obtained in the spring.) Show the seed-vessels and the seeds of the cabbage.

NOTES FOR COMPOSITION LESSONS

(Pupil's Composition Book, p. 20.)

I. Oral Work.

(1) Direct the attention of the class to the picture in their composition books.
(2) Question them regarding the picture.
(3) Insist upon each answer being given in the form of a complete sentence.
(4) Write down the answers on the black-board, and underline the words to be noted for spelling.

BLACK-BOARD

A. (1) The cabbage has a *short stem.*
(2) The cabbage has *large leaves.*
(3) The cabbage has a short stem and large leaves.

B. (1) The *middle* part of the cabbage is the *heart.*
(2) The leaves are *folded closely* in the heart.
(3) The *shape* of the heart is *round.*

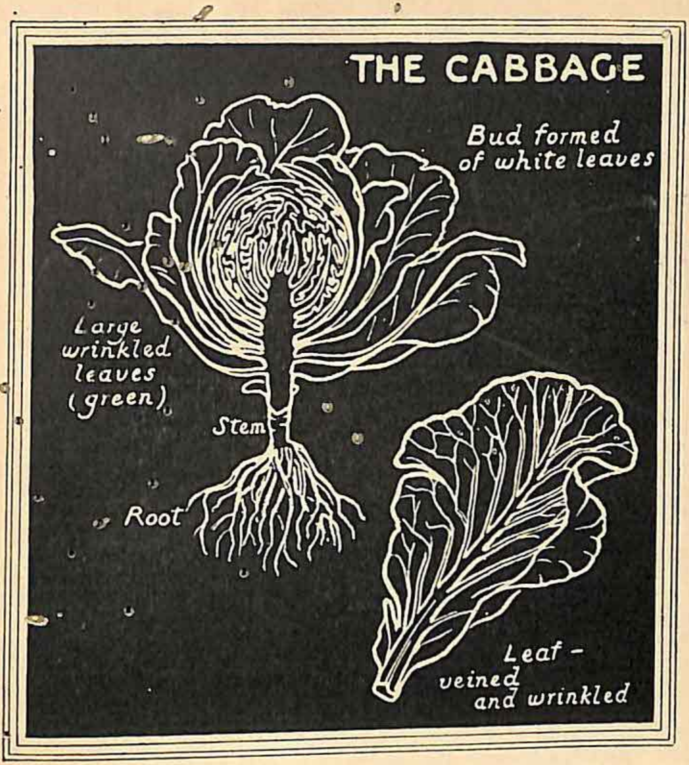
C. (1) A *stalk* runs up the middle of the cabbage leaf.
(2) The *veins* of the leaf *spread* out from the stalk.
(3) The *edge* of the cabbage leaf *curls* over.

II. Spelling.

(1) Write out the underlined words on the black-board.
(2) Draw attention to the long *a* sound of *ei* in *veins.* Give other examples, as *reins, veil.*
(3) Get children to give a list of words ending in *alk*, to group with *stalk*, as *walk, talk.*
(4) Treat other words in the same way, as *edge, ledge, wedge*, &c.
(5) Explain to the children that *ough* is sometimes sounded as *uff.* Examples: *tough, rough, enough.*
(6) Let children copy words on to their slates.

III. Written Tests.

(1) Clean the black-board. Arrange the children in groups A, B, C, to write the exercise with the corresponding letter.
(2) Correct carefully.


THE CABBAGE
Bud formed of white leaves
Large wrinkled leaves (green)
Stem
Root
Leaf - veined and wrinkled

BLACK-BOARD SUMMARY.

1. **Root.** — Branched. Fibrous. White.
2. **Stem.**—Thick. Green.
3. **Leaves.** — Wrinkled. Form a bud. Network of veins.
4. **Flowers.** — Yellow. Formed when the bud opens. Produce seeds.

NOTES FOR THE TEACHER.

The cabbage is another of the plants cultivated by man for the sake of the food they yield him. It is an eager feeder, and the surplus food which it draws from the air and the ground is stored by it in a variety of ways. The **head** of the common cabbage is a store of such surplus food laid up in the form of a bud. In the **kail** it is stored in the leaves, in **Brussels-sprouts** in small cabbages or buds, and in the **cauliflower** it is poured into the flower-heads. It is supposed that all the different varieties of cabbages have sprung from the *wild cabbage*, a not very common plant which grows on the sea-coast, often to a height of nearly two feet.

THE ONION.

Requirements.—A complete onion plant—one in flower if possible. One or two onions for making sections. Onion seeds. A knife.

Subject Matter.	Method.
1. **Root.**—A bunch of fibres. White. Grow down into the soil to absorb food for the plant.	1. Exhibit the root, and explain its use as in previous lessons.
2. **Stem.**—No true stem. Stem represented by a hard mass at the bottom of the bulb.	2. Show that stems are sometimes conspicuous, as in the cabbage; and sometimes inconspicuous, as in the daisy and dandelion.
3. **Bulb.**—A bud. Composed of soft, fleshy and juicy leaves, folded closely together. No fibres. Used as food.	3. Make longitudinal and transverse sections of the bulb, in order to show its structure.
4. **Leaves.**—Green. Long, tapering, hollow (tubular).	4. Make sections of the leaves.
5. **Flowers.**—In a large ball-like bunch. All the little flower-stalks branch from one point on the main stalk. Seeds are formed in the middle part of each flower. The main stalk bearing the flowers grows out from the centre of the bulb.	5. Exhibit a stalk of onion flowers, and explain the use of the flowers as organs of reproduction. Pass round the seeds for examination, and sow some in a box of soil, in order that the growth of the onion plant may be watched from time to time.

NOTES FOR COMPOSITION LESSONS

(Pupil's Composition Book, p. 21.)

I. Oral Work.

(1) Direct the attention of the class to the pictures in their composition books.

(2) Question them regarding each picture.

(3) Insist upon each answer being given in the form of a complete sentence.

(4) Write down the answers on the black-board, and underline the words to be noted for spelling.

BLACK-BOARD

A. (1) We grow onions in the *garden*.

(2) The *roots* of the onion are made of *little white fibres*.

(3) The roots of the onion suck *food* from the *soil*.

B. (1) The *large part* of the onion is *round*.

(2) The large part of the onion is *called* a *bulb*.

(3) The large part of the onion is round, and is called a bulb.

C. (1) The bulb of the onion is *hard*.

(2) It is made of *leaves folded closely*.

(3) The bulb of the onion is hard, and is made of leaves folded closely.

II. Spelling.

(1) Copy the underlined words on the black-board.

(2) Draw attention to the long *i* in *fibre*, and explain that *re* at the end of a word is sounded as *er*. Give other examples, as *fire*, *tire*, *mitre*, *metre*. Let children pronounce the words.

(3) Let children give words ending in *-oil*, as *toil*, *boil*, &c. Group on black-board with *soil*.

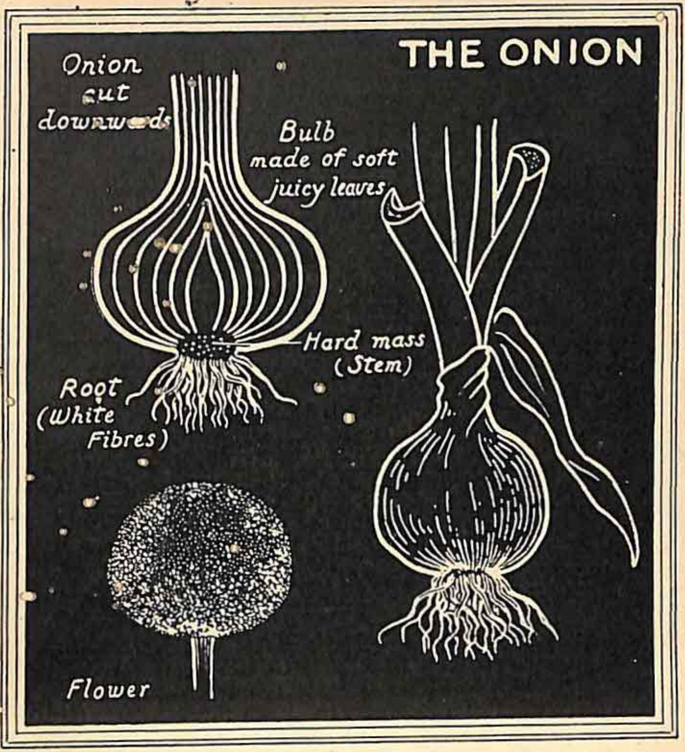
(4) Treat other words similarly, as *food*, *mood*, *brood*.

(5) Let children copy words on to their slates.

III. Written Tests.

(1) Clean the black-board. Arrange the children in groups A, B, C, to write the exercise with the corresponding letter.

(2) Correct carefully.



BLACK-BOARD SUMMARY.

Root.—White. Fibrous.
Stem.—None.
Bulb.—A bud.

Leaves.—Green. Hollow. Pointed.
Flowers.—In a ball-like bunch. Produce seeds.

NOTES FOR THE TEACHER.

The part of the onion of which we make use is the bulb. A **bulb** is a very much shortened stem, one in fact which has been reduced to a plate, from the lower side of which spring the roots, and from the upper side leaves in the form of scales. These scales form a covering as protection for the buds, of which there are usually three—a **terminal bud** and two or more **axillary buds**. In these scale leaves the plant stores up the surplus nourishment which it absorbs during its first or vegetative stage of existence. This store is drawn from in its second stage for the production of flowers and fruit. It is this store for the sake of which we cultivate the plant.

THE BUTTERCUP.

Requirements.—A buttercup plant complete. Also a bunch of the flowers for distribution.

Subject Matter.*	Method.
1. **Root.**—Consists of a few thick-branched fibres (arising, in one species, from a thick, hard, rounded body called a corm).	1. Compare the root with those previously examined.
2. **Stem.** — Long, green, tough. Bears leaves and flowers.	2. Break the stem, and show that its toughness is due to the presence of fibres.
3. **Leaves.**—Stalked. Veins arranged in a network. Shape variable.	3. Allow the children to examine and describe the leaves.
4. **Flower.** — Consists of parts arranged in whorls round the centre. (*a*) Outer whorl (calyx) of five hairy, green leaves (sepals). (*b*) *Corolla*—a whorl of five bright yellow leaves, within the calyx (petals).	4. Let each child have a flower, and examine each of the whorls in succession, pulling off each of the parts for examination after the flower has been studied as a whole.
(*c*) *Stamens*—a dense cluster of pollen-cases (*anthers*) on stalks (*filaments*), arranged in a whorl within the corolla.	Collect some of the pollen grains on a sheet of black paper.
(*d*) *Pistil*—a cluster of seed-cases (*ovaries*) occupying the centre of the flower.	Open one of the ovaries in order to show the ovule within.

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* The name "buttercup" is applied to several species of the *Ranunculaceæ*, and the description must be adapted, where necessary, to the one chosen for the lesson.

NOTES FOR COMPOSITION LESSONS

(Pupil's Composition Book, p. 22.)

I. Oral Work.

(1) Direct the attention of the class to the pictures in their composition books.
(2) Question them regarding each picture.
(3) Insist upon each answer being given in the form of a complete sentence.
(4) Write down the answers on the black-board, and underline the words to be noted for spelling.

BLACK-BOARD

A. (1) The *buttercup* is a *wild flower*.
(2) The buttercup grows in the fields.
(3) The buttercup is a wild flower, and *grows* in the *fields*.

B. (1) The *buds* of the buttercup are *round*.
(2) The buds grow on the *ends* of the *stems*.
(3) The buds of the buttercup are round and grow on the ends of the stems.

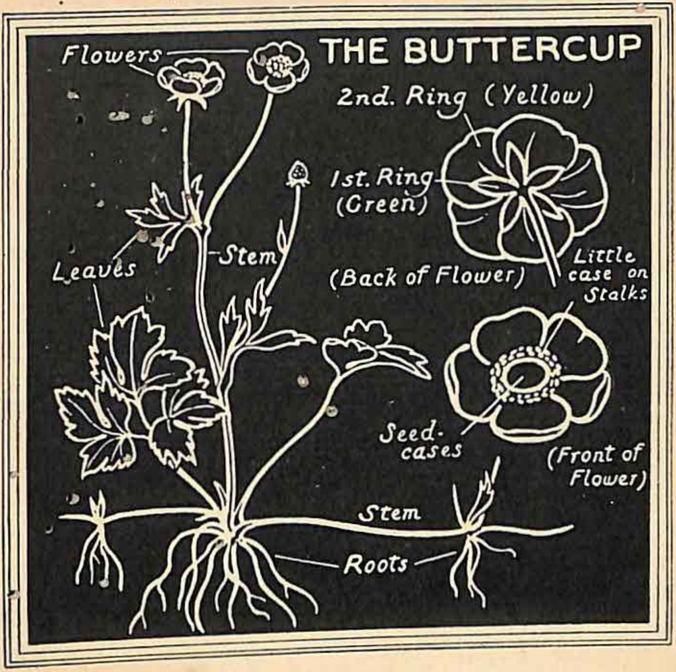
C. (1) The buttercup has *five yellow leaves*.
(2) *Little stalks* grow up inside these.
(3) The *middle* of the buttercup is *covered* with *little seeds*.

II. Spelling.

(1) Copy the underlined words on black-board.
(2) Let children give other words ending in *-ild*, to group on black-board with *wild*, as *child*, *mild*, &c.
(3) Treat other words in similar manner.
(4) Draw attention to the long *e* sound of *ie* in *fields*, and illustrate in other words, as *shield*, *chief*, &c.
(5) Draw attention to the *al* in *stalks*, sounded as *aw*. Give other examples, as *walk*, *chalk*, *talk*, and group on black-board.
(6) Let children copy words on slates.

III. Written Tests.

(1) Clean the black-board. Arrange the children in groups A, B, C, to write the exercise with the corresponding letter.
(2) Correct carefully.



BLACK-BOARD SUMMARY.

1. **Root.**—Fibrous.
2. **Stem.**—Green. Tough.
3. **Leaves.**—Stalked. Veins.
4. **Flower.**—Parts in circles.
   Outer—Green.
   Second—Yellow.
   Third—Little cases on stalks.
   Fourth—Seed-cases.

NOTES FOR THE TEACHER.

A **corm** is a short, fleshy, solid underground stem, from the under surface of which roots are given off, and from the upper surface **buds** and **leaves**. The **calyx** and **corolla** are chiefly for the protection of the central parts of the flower, and are often called, especially when not easily distinguished from each other, the **perianth**. The bright coloured leaves of the corolla and the scent draw insects to the plant, and so help towards the formation of seed. The **stamens** are the male or fertilizing organs of the flower, and the collection of stamens is called the **andrœcium**, or male-household; while the **pistil**, called also the **gynœcium** or female-household, consists of a closed **ovary** with one or more *ovules*, and a **stigma** for receiving the pollen grains. Note that the *ovule* will not grow into a seed unless it be fertilized.

THE PEA-POD.

Requirements.—Some pea-pods, and a number of flowers from the pea plant. Also a portion of the pea plant with pods attached.

Subject Matter.	Method.
1. **The Pod.**—A fruit. *Stalk* short, with five little green leaves (sepals of the flower) at the end. *Pod* formed of two parts, which readily separate when pressed. Splits open of itself when ripe.	1. Let each child examine a pea-pod, and describe its stalk, form, colour, &c. Show a portion of a pea plant with pods attached.
2. **The Peas.**—All fastened along one edge of the pod, by means of very short stalks. The peas are seeds, each of which will grow into a plant if placed in the soil and kept moist.	2. Each of the children should open a pod, and note how and where the seeds are attached. Explain that the peas are seeds, and compare with other seeds previously examined.
3. **How the Pod grows.**—The pod is formed in the centre of the pea flower. After the other parts of the flower have decayed and fallen off, the pod and the seeds within it continue to grow and ripen. If left on the plant long enough, the pod splits, and the seeds fall on the soil, where they grow into new plants.	3. Let each child examine the pea flower, and observe the young pod in the centre. Show pods in different stages of growth. Sow a few peas of the previous season in a box of soil, and watch the growth of the pea plant at intervals of a few days.

NOTES FOR COMPOSITION LESSONS

(Pupil's Composition Book, p. 23.)

I. Oral Work.

(1) Direct the attention of the class to the pictures in their composition books.
(2) Question them regarding each picture.
(3) Insist upon each answer being given in the form of a complete sentence.
(4) Write down the answers on the black-board, and underline the words to be noted for spelling.

BLACK-BOARD

A. (1) The *pea-pod hangs* by a *stalk*.
(2) The pea-pod holds the *peas*.
(3) The peas *lie* in a *row*.

B. (1) We *split* the pea-pod *open* to get the peas.
(2) The peas are *round* in shape.
(3) They are *fixed* in *their places* by *little stalks*.

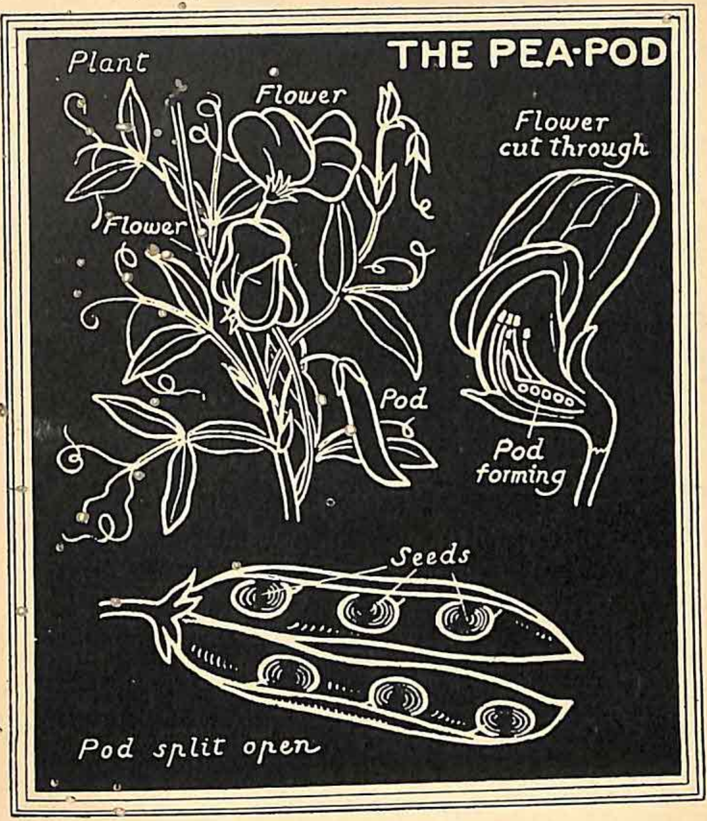
C. (1) The pea-flower is like a *butterfly* in shape.
(2) The *young* pod grew at *first inside* the *flower*.
(3) The peas are *green*.

II. Spelling.

(1) Write out the underlined words on black-board.
(2) Get children to supply words like *lie*, as *pie*, *tie*, &c.
(3) Treat other words in the same way in groups on black-board.
(4) Draw attention to the *u* sound of *ou* in *young*. Illustrate further by *rough*, *touch*.
(5) Let the children copy the words on their slates.

III. Written Tests.

(1) Clean the black-board. Arrange the children in groups A, B, C, to write the exercise with the corresponding letter.
(2) Correct carefully.



BLACK-BOARD SUMMARY.

1. **Pod.**—On a stalk. A fruit. Splits into two parts.
2. **Peas.**—Seeds.
3. **How the Pod grows.**—Formed in the centre of the flower.

NOTES FOR THE TEACHER.

The fruit of the pea is a **simple fruit**, that is, it is the result of the ripening of a **single pistil**. Simple fruits like the pea that split into two pieces or valves are called **legumes**. All dry dehiscent fruits are called **pods**, although the name is more usually given to fruits like the pea. If the pod opens along one side only—usually the inner—it is called a **follicle**. The pod or fruit formed by the development of any compound **pistil** is called a **capsule**.

THE CHERRY.

Requirements.—A number of cherries. A small branch of a cherry-tree, with fruit attached. Picture of cherry-tree in flower. Other stone-fruits for comparison.

Subject Matter.	Method.
1. **The Cherry.**—A fruit. Hangs on long slender stalks. Covered with a thin skin. Soft, juicy, and sweet. A hard stone within.	1. Each child should examine a cherry, and describe its parts.
2. **The Stone.**— The stone a seed. Very hard woody covering. A soft seed (kernel) within. Covered with a thin skin.	2. Compare with other fruits previously examined. Explain that the hard shell protects the kernel, but decays after a time when in the ground. The stones should be opened for the children, in order to allow them to study the kernel.
3. **How the cherry grows.**— Formed from the middle portion of the flower. This portion grows larger and ripens after the other parts of the flower have decayed and fallen.	3. Show a picture of cherry blossom, and a branch of a cherry-tree with fruit. Explain the formation of the fruit from the flower, and compare its growth with that of the pea.

NOTES FOR COMPOSITION LESSONS

(Pupil's Composition Book, p. 25.)

I. Oral Work.

(1) Direct the attention of the class to the pictures in their composition books.
(2) Question them regarding each picture.
(3) Insist upon each answer being given in the form of a complete sentence.
(4) Write down the answers on the black-board, and underline the words to be noted for spelling.

BLACK-BOARD

A. (1) The *cherry* is a *fruit.*
(2) It grows in *bunches.*
(3) The cherry is a fruit and grows in bunches.

B. (1) The cherry is *round.*
(2) It has a *slender stalk.*
(3) The cherry is round and has a slender stalk.

C. (1) The *soft* part of the cherry is *covered* with a *skin.*
(2) The skin is *smooth.*
(3) The cherry has a *stone* inside.

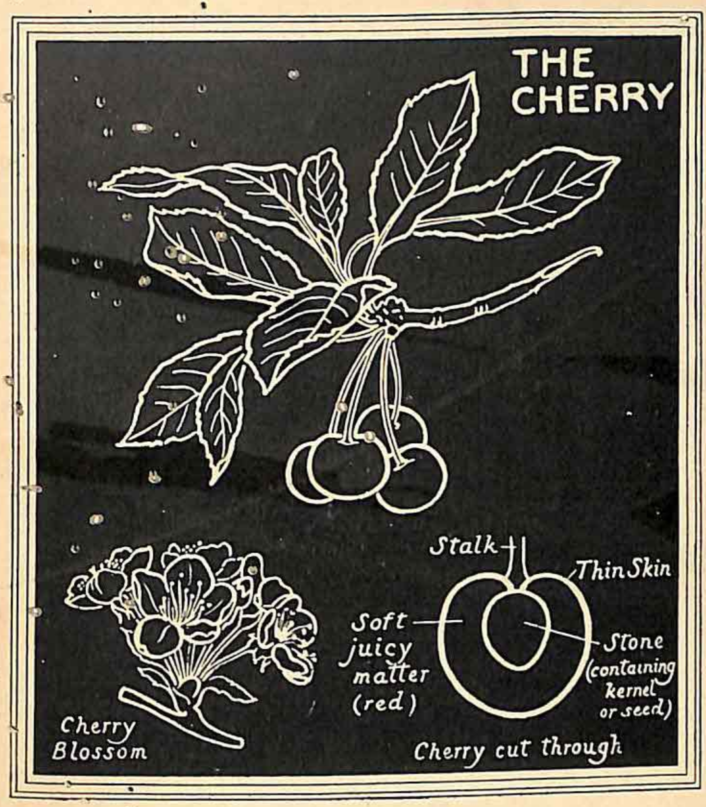
D. (1) The cherry-stone has a *hard shell.*
(2) It has a *kernel* inside.
(3) The cherry-stone has a hard shell and a kernel inside.

II. Spelling.

(1) Write out the underlined words on black-board.
(2) Let children supply words ending in *-erry—berry, ferry, merry.* Group on black-board with *cherry.*
(3) Treat other words in the same way.
(4) Draw attention to the *oo* sound of *ui* in *fruit.* Give other examples, as *suit, juice.*
(5) Let children copy words on their slates.

III. Written Tests.

(1) Clean the black-board. Arrange the children in groups A, B, C, D, to write the exercise with the corresponding letter.
(2) Correct carefully.



BLACK-BOARD SUMMARY.

1. **The Cherry.**—A fruit. Stalk. Thin skin. Soft and juicy.
2. **The Stone.**—A seed. Hard shell. Kernel within.
3. **How it grows.**—Formed from the middle part of the flower.

NOTES FOR THE TEACHER.

The cherry, like the plum and peach, is a fleshy fruit. It is **indehiscent.** These fruits are known as **drupes** or **stone-fruit.** Such fruits are to be distinguished from the **pome**, the name given to the fruit of the apple, the pear, &c., and also from berries, such as grapes, gooseberries, &c. True **drupes** are one-celled and one-seeded; the outer portion becomes fleshy or pulpy, and the inner stony. It is from this inner portion that the new plant springs. Small drupes are often mistakenly called berries.

NUTS.

Requirements.—Some hazel nuts. Branch of the hazel bush with nuts. Picture of hazel flowers.

Subject Matter.	Method.
1. **The Nut.**—On a woody stalk. Surrounded by an irregular green cup. The nut a fruit. Shell brown, with a soft lining within. Kernel covered with a brown skin. A seed. Readily splits into two equal parts.	1. Each child should have a nut for examination and description. Compare the nut with the other fruits examined, and the kernel with the seeds previously described. Show that the kernel splits, like peas and beans.
2. **How the nut is formed.**— Produced from the flower. Flowers formed in the spring. The nut is the ripened seed-case of the middle of the flower.	2. Explain how the nut is developed from the flower, and compare its growth with that of other fruits previously examined.

NOTES FOR COMPOSITION LESSONS

(Pupil's Composition Book, p. 27.)

I. Oral Work.

(1) Direct the attention of the class to the pictures in their composition books.
(2) Question them regarding each picture.
(3) Insist upon each answer being given in the form of a complete sentence.
(4) Write down the answers on the black-board, and underline the words to be noted for spelling.

BLACK-BOARD

A. (1) We *gather* nuts from *hazel-trees.*
(2) We gather nuts in *autumn.*
(3) We gather nuts from hazel-trees in autumn.

B. (1) We *eat* the *kernel* of the nut.
(2) We *crack* the shell to get the kernel out.
(3) The kernel will *split* into *two parts.*

C. (1) The shell of the nut is *brown.*
(2) It *becomes* brown when it is *ripe.*
(3) The kernel of the nut is the *seed.*

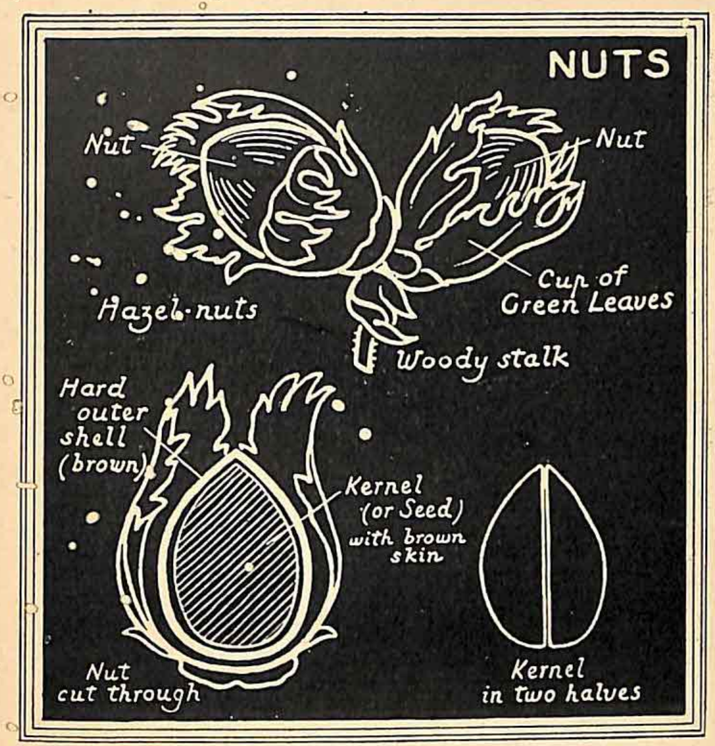
D. (1) The nut grows in a *green cup.*
(2) The cup is made of *leaves.*
(3) The nut grows in a green cup made of leaves.

II. Spelling.

(1) Copy the underlined words on black-board.
(2) Draw attention to the silent *n* which ends the word *autumn*. Give other examples, as *hymn*, *column.*
(3) Point out that *ea* in *eat* and *ea* in *leaves* is sounded as *e* long. Get the children to give other examples, as *meat*, *seat*, *weaves*, *sheaves*, to group with *eat* and *leaves.*
(4) Let children copy words on their slates.

III. Written Tests.

(1) Clean the black-board. Arrange the children in groups A, B, C, D, to write the exercise with the corresponding letter.
(2) Correct carefully.



BLACK-BOARD SUMMARY.

1. **The Nut.**—On a woody stalk. A fruit. Green cup outside. Kernel within. Kernel a seed. Has a brown skin.

2. **How the nut grows.**—Formed from the centre of the flower of the hazel bush.

NOTES FOR THE TEACHER.

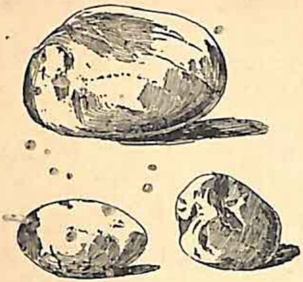
A nut is a hard, **one-celled** and **single-seeded indehiscent** fruit. It is usually produced from an **ovary** of two or more cells, with one or more **ovules**, in each of which all but the **single ovule** and **single cell** have disappeared. The nut is often enclosed in a kind of cup, which still further protects the seed. This cup is called a **cupule**. Such is the husk of the hazel nut, the cup of the acorn, and the prickly husk or covering of the Spanish chestnut.

The kernel contains, besides the **embryo**, a considerable amount of nourishment, on which the young plant lives till it can support itself. It is this store which men turn to account, using it as food for animals and for themselves.

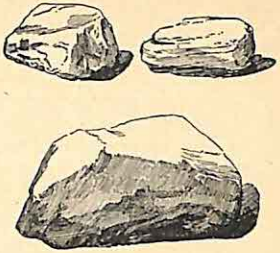
SAND.

Requirements.—Fine sand, coarse sand, gravel, and small pebbles. Also some specimens of sandstone.

Subject Matter.	Method.
Description.—	
Consists of particles or grains, each of which is a small stone. Grains sometimes very small—fine sand; and sometimes larger—coarse sand. Gravel is a mixture of sand and small pebbles, with, sometimes, more or less clay. In both sand and gravel the particles are rounded—the edges smoothed or worn completely off.	Let each child examine some specimens of sand—fine and coarse; also gravel and pebbles. These should all be described in turn by the children.
Formation.—	
Sand is found in the beds of rivers, and at the sea-side. Stones are knocked together by the action of the moving water. Their edges are thus worn off, and they are gradually reduced in size, till, at last, sand is formed. Pebbles and gravel are formed in the same manner. Grains of sand sometimes become joined together, forming a rock called sandstone. A grindstone is made of sandstone.	Explain the formation of sand and gravel by the mechanical action of water, and arrange for a visit to a sand-pit, a gravel-pit, a rivulet, or the sea-beach if possible. Explain, also, that sand now remote from water, marks the presence of moving water in the spot at some former period. Exhibit some specimens of sandstone, and explain their formation.
Uses of Sand.—	
Used for making mortar.	Show a piece of mortar, and point out the grains of sand in it.
Fine sand used for cleaning and scouring.	Clean a piece of dirty metal by rubbing wet, fine sand over it; and show how a rough surface may be smoothed by means of sand.



Sea-worn Stones.



River-worn Stones.

Sandstone.

Black-Board Summary.

Sand.—

Pieces rounded. Edges worn off.

How formed.—

By running water. In rivers or the sea.

NOTES FOR THE TEACHER.

Sands of all degrees of fineness occur, from sand almost as fine as dust to fine gravel. The finer sand will be found on examination more angular than the coarser. Specimens of different degrees of fineness should be examined under a magnifying-glass. As rocks are broken up, or **disintegrated**, sand or clay is produced. The sand consists chiefly of the insoluble particles of **quartz**, and the clay of the other materials of which the rock was composed. When the grains of sand are cemented together they form a sandstone. The cement which holds the grains of sand together varies greatly both in kind and quantity. Sandstones are all more or less porous, though in some cases the texture is very close. When sufficiently hard they are employed in building. Some of them are so hard that they are used for millstones, pavements, &c. Sand is used in the manufacture of glass.

GLASS.

Requirements.—A square piece of window-glass; and a few long, narrow strips of the same. A few inches of platinum wire, a little fine silver sand, lime, dry "soda" (carbonate of soda), oxide of lead (red-lead), a Bunsen burner or spirit-lamp, a blow-pipe, and a knife. Also a few pieces of thin glass tubing or glass rod, and, if possible, a glazier's diamond. Various articles illustrating the uses of glass.

Subject Matter.	Method.
How made.—	
Glass is made by melting together soda or potash, sand, lime, oxide of lead, and other substances.	Show the materials, and perform the experiment for which instructions are given below.
Properties.—	
Transparent.	Compare with opaque substances.
Brittle.	Illustrate by breaking glass.
Flexible.	Show that long strips of window-glass bend.
Hard. As hard as steel. Not so hard as a diamond, and therefore a diamond will cut and scratch glass.	Show that glass cannot be cut with a knife, being as hard as steel, but may be cut with a diamond, which is harder than glass.
Fusible.	Soften thin glass tubing or rod in the flame of a gas-burner or spirit-lamp, and then bend it and twist it. Explain that it becomes liquid when heated more strongly.
Uses.—	
For windows, lamps, lanterns, &c. For making bottles and other vessels.	Exhibit various articles made of glass.

Experiment.—Mix a little clean silver sand with about four times its weight of dry carbonate of soda. Make a small loop, about an eighth of an inch in diameter, at the end of a piece of platinum wire. Heat the loop in a blow-pipe flame, and apply it, while red hot, to the above mixture. Heat it again, and repeat the process till the loop is filled with the fused substance. Still continue to apply heat, and a small bead of glass will be obtained.

BLACK-BOARD SUMMARY.

How made.—

By melting together sand, soda, lime, and other substances.

Properties.—

Allows light to pass through it.
Breaks easily.
Thin glass will bend.
Very hard.
Will melt.

Uses.—

For windows, lamps, bottles, &c.

NOTES FOR THE TEACHER.

There are various kinds of glass, such as **sheet glass**, **crown** or **window glass**, **plate glass**, **flint glass**, and **bottle glass**. Of all these the chief constituent is sand in some form, or powdered flint, mixed with soda or potash and lime or red-lead. The nature of the glass depends on the kind and the quality of the materials of which it is composed. Different kinds of glass are used for different purposes. Sheet and crown are used largely for windows, though the use of sheet glass has almost superseded that of crown. Plate glass, ground and polished, is used for windows, mirrors, &c.; and in the rough or unpolished form it is used for roofing, &c. Flint glass or crystal is largely used for table utensils, ornaments, &c. Optical glass is made of special varieties of flint and crown glass.

CHALK.

Requirements.—Some pieces of chalk in its rough state. Prepared chalk. Sticks of chalk. Whiting. A piece of lime. Picture of a chalk pit or quarry. Fossils from chalk, or pictures of the same.

Subject Matter.	Method.
Properties.—	
White, but not bright.	Compare with a *bright* white substance.
Soft. Can be scratched and cut with a knife, and even scratched with the finger-nail. When used for writing, little pieces are rubbed off.	Pieces of chalk should be distributed, and the properties tested by the children.
Brittle.	Illustrate by breaking and crushing chalk.
Porous. Absorbs water and other liquids readily.	Show porosity by dipping the end of a stick of chalk in ink.
Uses.—	
For writing.	
For cleaning and white-washing. Whiting or whitening is a purified chalk, used for cleaning windows and plate, and for washing ceilings.	Exhibit whiting, and illustrate its use for cleaning and also for white-washing.
For making lime. Lime is prepared by "burning" chalk in a large furnace called a lime-kiln.	Exhibit a piece of lime, and explain how it is prepared.
How formed.—	
Chalk is formed of the shells of small marine animals. When the animals died the shells sank down and formed a deposit at the bottom of the sea.	Exhibit a diagram of the shells found in chalk, and explain how the rock was formed.

BLACK-BOARD SUMMARY.

Properties.—

White. Not bright.
Soft.
Brittle.
Porous.

Uses.—

For writing.
For cleaning and white-washing.
For making lime.

How formed.—

Formed of little shells that were once at the bottom of the sea.

NOTES FOR COMPOSITION LESSONS

(Pupil's Composition Book, p. 29.)

I. Oral Work.

(1) Direct the attention of the class to the pictures in their composition books.

(2) Question them regarding each picture.

(3) Insist upon each answer being given in the form of a complete sentence.

(4) Write down the answers on the black-board, and underline the words to be noted for spelling.

BLACK-BOARD

A. (1) *Chalk* is a *soft kind* of rock.

(2) Chalk is dug from the chalk *quarry*.

(3) Chalk is a soft kind of rock, and is dug from the chalk quarry.

B. (1) The *building* near the chalk quarry is a *kiln*.

(2) Chalk is *burnt* in the kiln.

(3) Chalk is burnt to make *lime*.

C. (1) Chalk is *white*.

(2) It is used at *school* for *writing* on the *black-board*.

(3) Chalk is white, and is used at school for writing on the black-board.

D. (1) The sides of a chalk quarry are *high*.

(2) The men dig pits in the quarry to get the chalk from below.

II. Spelling.

(1) Write out the underlined words on the black-board.

(2) Draw attention to the silent *l* in chalk, and point out that the *al* is sounded like *aw*. Get from children other examples to group with *chalk*, as *walk*, *talk*.

(3) Draw attention to the silent *w* in *writing* and the silent *gh* in *high*. Give other examples, as *wring*, *wrong*; *nigh*, *night*; *sigh*, *sight*.

(4) Get from children words of similar sound, to group with *kind*, *lime*, &c.

(5) Let children copy words on their slates.

III. Written Tests.

(1) Clean the black-board. Arrange the children in groups A, B, C, D, to write the exercise with the corresponding letter.

(2) Correct carefully.

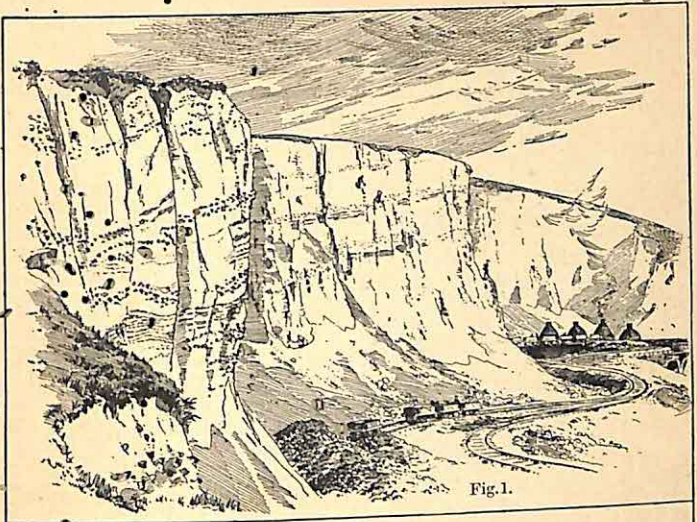


Fig. 1.

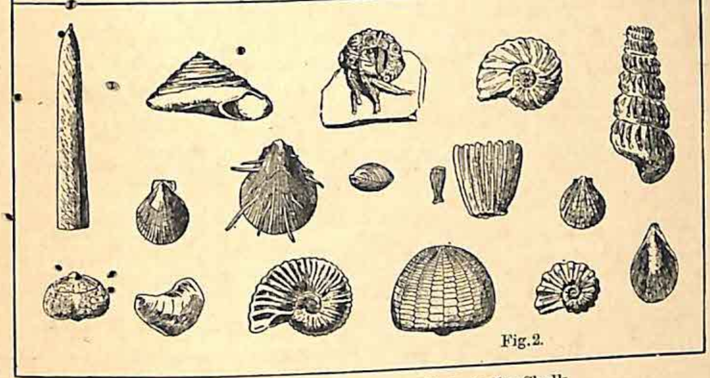


Fig. 2.

Fig. 1.—Chalk Quarry—showing Flints in the Chalk.
Fig. 2.—Shells (Foraminifera) found in the Chalk.

NOTES FOR THE TEACHER.

Chalk is still being formed in the sea. It is made up of **lime** and **carbonic acid** mixed with various impurities. Among its other uses it may be mentioned that it is mixed with **wet clayey soils**, because it makes them better able to grow certain crops. When burned it produces what is called **quick-lime. Quick-lime** is chalk from which the carbonic acid has been driven off by heat. It is of a brownish-white colour, and crumbles easily. Lime is very largely used in farming, as well as for making mortar, &c.

CLAY.

Requirements.—Dry clay. Powdered clay. Moist clay for moulding. Various articles made of clay. A saucer. A jug of water.

Subject Matter.	Method.
Properties.—	
(*a*) *Dry Clay.*—Soft, but brittle. Easily broken and powdered.	(*a*) Exhibit dry clay. Crush it to pieces.
Absorbs water, becoming much heavier.	Place a piece in a saucer containing water. Show that the water is gradually absorbed.
(*b*) *Moist Clay.*—Soft, plastic. Can be moulded into any form. Is porous, but will hold water for some time.	(*b*) Exhibit moist clay. Mould it into the form of a cup. Show that it will hold water for a time.
Formation.—	
Formed by the action of water on certain rocks. Hence it is to be found in hollows, where it has been carried by running water.	Explain that clay is formed, like sand, by the action of water, but from rocks of a different nature.
Beds of clay, now remote from water, mark positions where water once existed.	The children should be allowed to examine a bed of clay *in situ* if possible.
Uses.—	
For making bricks, cups, dishes, &c.	Exhibit various articles made of clay.

BLACK-BOARD SUMMARY.

Properties.—

(*a*) *Dry Clay.*—Soft. May be powdered. Porous.

(*b*) *Moist Clay.*—Soft. May be moulded. Porous.

Formation.—

Formed by action of water on certain rocks.

Uses.—

For making bricks, cups, &c.

NOTES FOR THE TEACHER.

Clay is formed from the **decomposition** of various rocks, and varies very much in appearance and qualities, though it is not easy to decide from what particular kind of rock a special clay has been formed. The colours of clays are various, though all are dull and opaque. Among the different kinds of clays may be noted **kaolin** or china-clay, **pipe-clay, potter's clay, fuller's earth, brick-clay, fire-clay,** &c. Clay contains a substance called *alumina*, from which the metal *aluminium* is obtained.

A JUG.

Requirements.—A brown jug. A white jug. A flower-pot, with a cork to stop the hole at the bottom; and a few other articles of unglazed earthenware.

Subject Matter.	Method.
Form.— Form varies, but always a lip for convenience in pouring; and a flat bottom, to enable the jug to stand firmly. Also a handle.	Note general form, and let it be sketched. Explain use of lip. Why a flat bottom. (Compare with a round-bottomed "soda-bottle".)
How made.— Clay moulded. Then baked. Baked clay is porous, and must therefore be glazed. The glaze is a kind of glass, prepared by heating a mixture on the surface of the clay. The glaze not porous.	Exhibit a picture of a potter at work; or, still better, arrange for a visit to a pottery. Pour water into a flower-pot, the hole of which is stopped with a cork. The water comes through. Hence the necessity for glazing utensils that are required to hold water. Exhibit articles of unglazed earthenware.

BLACK-BOARD SUMMARY.

Form.—
Flat bottom. Lip.

How made.—
Clay baked.
Then glazed.
If not glazed, it will not hold water well.

SLATE.

Requirements.—Picture of a slate quarry. A roofing slate, a thick slab of slate, and some smaller pieces. Also a piece of enamelled slate, and slate pencils.

Subject Matter.	Method.
Properties.—	
Colour, bluish-gray.	Compare with blue and with gray.
Hard. Harder than slate-pencil; hence the pencil is worn away more than the slate when we write with the former on the latter.	Show that it is hard and brittle by breaking it. Prove that it is harder than slate-pencil.
Brittle. Breaks when we let it fall. May be broken with a hammer. Breaks more easily in one particular direction; hence easily split into slabs or thin sheets.	Illustrate the cleavage by splitting a thick piece into thinner pieces. Show that it does not break easily in any other direction.
Not very porous. Will hold water well.	Pour water into a hollow in slate, to show that it is not very porous.
Uses.—	
For roofing. Keeps rain out of our houses.	Show that the various uses of slate depend on the properties just considered.
For making cisterns to hold water.	
For making mantel-pieces and for various ornamental purposes. When thus employed it is enamelled, to imitate polished marble.	Exhibit a piece of enamelled slate.
For making school slates.	
How obtained.—	
Slate is a rock. Found largely in Wales, in various parts of England, and in other countries.	Exhibit a picture of a slate quarry, and explain the nature of the work carried on there. If a slate quarry exists in the neighbourhood of the school, arrange for a visit to it.
The place where it is dug out and worked is called a quarry.	

NOTES FOR COMPOSITION LESSONS

(Pupil's Composition Book, p. 31.)

I. **Oral Work.**

(1) Direct the attention of the class to the pictures in their composition books.

(2) Question them regarding each picture.

(3) Insist upon each answer being given in the form of a complete sentence.

(4) Write down the answers on the black-board, and underline the words to be noted for spelling.

Note.—A map of England and Wales should be shown to the children, and the position of the mountains in Wales pointed out.

BLACK-BOARD

A. (1) *Slate* is dug from mountains in *Wales*.
(2) Slate is a *hard* kind of *rock*.
(3) Slate is dug from mountains in Wales, and is a hard kind of rock.

B. (1) The place *where* slate is dug is *called* a *slate quarry*.
(2) The *sides* of the quarry look like *steps*.
(3) It is *easy* to split slate into thin *pieces*.

C. (1) Slate is used in *schools* for *writing* upon.
(2) School slates are *smooth*.
(3) *Builders* use slates for the *roofs* of *houses*.

D. (1) Slate is got from the quarry in *large blocks*.
(2) It is split into thin pieces *afterwards*.
(3) Slate is got from the quarry in large blocks, and afterwards split into thin pieces.

II. **Spelling.**

(1) Copy the underlined words on the black-board.

(2) Draw attention to the long *e* sound of *ea* in *easy* and *ie* in pieces. Give other illustrations, as *eat*, *lean*, *meat*; *chief*, *field*.

(3) Build up the words *mountains*, *called*, *builders*, &c. Draw attention to *d* sound of *ed* in *called*, and the silent *u* in *builders*.

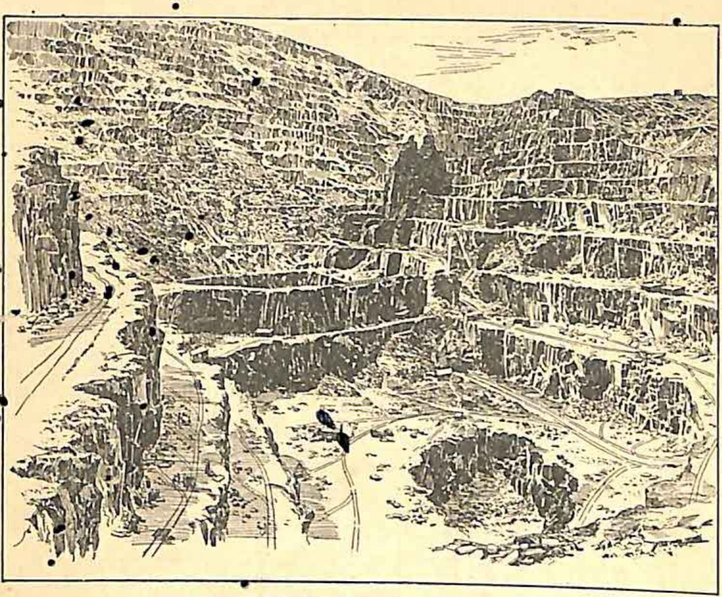
(4) Get children to give list of words like *sides*, as *tides*, *glides*, and group on black-board.

(5) Let children copy words on their slates.

III. **Written Tests.**

(1) Clean the black-board. Arrange the children in groups A, B, C, D, to write the exercise with the corresponding letter.

(2) Correct carefully.



Penrhyn Slate Quarry.

BLACK-BOARD SUMMARY.

Properties.—

Bluish-gray.
Hard and brittle.
Harder than slate-pencil.
Breaks easily into slabs and sheets.
Not very porous.

Uses.—

For roofing.
For making cisterns and mantel-pieces.
For school slates.

NOTES FOR THE TEACHER.

Slate, like the pencil with which we write on it, is composed of clay, and is of a dull blue, gray, or green colour. It is, of course, very much harder than the pencil, being a very close-grained and very hard rock. It does not crumble as sandstone is liable to do on being exposed to the action of the weather. This quality, the readiness with which it can be split into thin slabs, and its being almost impervious to water, make it very suitable for a roofing material.

LEAD.

Requirements.—A piece of lead pipe, a piece of sheet-lead, some lead shot, a slab of iron or hard stone, a hammer, a knife, a sheet of white paper, an iron spoon, a spirit-lamp or gas burner, lead ore.

Subject Matter.	Method.
Properties.—	
Colour, bright bluish-white, but tarnishes when exposed to air.	Scrape the surface of a piece of lead to show its colour.
Soft. May be scratched with the finger-nail, and easily cut with a knife. When rubbed on paper some lead comes off on the paper. Bends easily. May be hammered out flat.	Cut it with a knife, and scratch it with the finger-nail. Rub some lead shot on paper. Bend a piece of lead pipe, and flatten a shot by hammering it on a slab of iron or hard stone.
Melts when heated in a gas or spirit-lamp flame. Will then pour like water—is a liquid. Solidifies again as it cools. Very heavy.	Melt a little lead in an iron spoon; and then pour it out to cool. Let the children handle a large piece.
Uses.—	
For making water-pipes. For making shot. Sheet-lead used for roofing.	Exhibit a piece of lead water-pipe, sheet-lead, and lead shot.
How obtained.—	
Found in the earth, where it is always mixed with other substances. Then known as lead ore.	Exhibit a piece of lead ore.

BLACK-BOARD SUMMARY.

Properties.—
Bluish-white.
Very soft.
Bends easily.
Melts in gas-flame.

Uses.—
For making water-pipes.
For roofing.
For making shot.

How obtained.—
From lead ore.
Lead ore dug out of the ground.

NOTES FOR THE TEACHER.

The lead ore from which lead is chiefly obtained in this country is called **galena**, and is of a bluish-gray colour. It is very lustrous and very brittle. It consists of lead combined with sulphur, about 85 per cent of the one and 15 per cent of the other. Silver is also invariably found mixed with it. Britain, Spain, and Germany are the chief lead-producing countries of Europe. More than a third of all the lead produced in Britain comes from the Crossfell district in England. The United States is now one of the chief lead-producing countries.

NORMAL SCHOOL
CALCUTTA

BLACK-LEAD.

Requirements.—Black-lead pencils, a block of black-lead, a sheet of white paper, a piece of crude plumbago, a knife.

Subject Matter.	Method.
Properties.—	
Colour, black.	Exhibit a piece of black-lead.
Presents a very bright surface when rubbed.	Rub it till its surface is very bright.
Not hard. May be cut with a knife, and scratched with the finger-nail.	Cut it, and scratch it with the finger-nail.
Will write on paper.	Explain that some of the black-lead is rubbed off on to the paper when we write with it. Compare with lead.
Will not bend, but breaks easily. May be crushed to a powder.	Contrast with the metal lead.
Uses.—	
For writing.	Show how the writing varies with the degree of hardness of the black-lead.
For polishing stoves, &c.	Compare the surface of black-lead with that of a metal.
Where found.—	
Dug out of the ground.	Exhibit plumbago (black-lead) in its crude state.

Black-Board Summary.

Properties.—
Black.
Not hard.
Will not bend.
Breaks easily.

Uses.—
For writing.
For polishing stoves.

Where found.—
Dug out of the ground.

NOTES FOR THE TEACHER.

Black-lead, called also **graphite** or **plumbago**, is a mineral occurring in fissures in granite rocks, and found also in beds and masses in some of the older rocks. It is composed chiefly of **carbon**, mixed with a great variety of other substances. It is found in Siberia, Spain, Canada, the United States, Ceylon, and many other parts of the world. The extensive supplies at Borrowdale in Cumberland are now exhausted. In comparing **black-lead** with **lead** be careful to show that while both are **lustrous** and both **mark paper**, the former is darker in colour, is brittle, does not melt.

SODA.

Requirements.—Soda crystals, a tumbler, water (hot and cold), evaporating basin, stand for the basin, Bunsen burner or spirit-lamp.

Subject Matter.	Method.
Properties.—	
Colourless and transparent.	Compare with glass.
Brittle.	Crush some of the soda.
Soluble in water. Dissolves more rapidly in hot water.	Dissolve some in a glass of cold water, and repeat the experiment with hot water.
Soda crystals contain much water. When the water is driven off by heat, the soda is white and opaque.	Heat soda in an evaporating basin. Much water is driven off as steam and thus dry soda is obtained.
If a solution of soda is evaporated, the water is driven off, but the soda remains.	Evaporate a solution of soda to obtain the solid again.
Uses.—	
For cleaning. Water will not remove grease, but a solution of soda will. For making soap. Used in the manufacture of glass.	Illustrate the cleansing power of soda by showing that it will clean a greasy object. Show that pure water will not do this.

Black-Board Summary.

Properties.—	**Uses.**—
Colourless.	For cleansing.
Breaks easily.	For making soap.
Dissolves in water.	For making glass.
Hot water dissolves it better.	

NOTES FOR THE TEACHER.

Soda is found in a native state and is even worked for use in some parts of the world. It occurs mixed with other substances in the natron lakes of Hungary, Armenia, &c., but formerly it was chiefly got, along with various other products, from the ashes of burned sea-weeds (**kelp**), and from the ashes of certain plants that grow in the salt marshes along the sea-shore in Spain and elsewhere (**barilla**). It is now obtained chiefly from **common salt.**